VIA · VERITAS · VITA

In Classe anatomica
Discipulus,
INGENIO AC LABORE
Insignis,
PRÆMIUM HOCCE
Merito Consecutus Est.

Apud Coll. Glasg.
Imo die Maii,

OUTLINES

OF

PATHOLOGY.

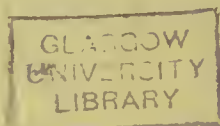BY

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WILLIAM BLACKWOOD, EDINBURGH; AND
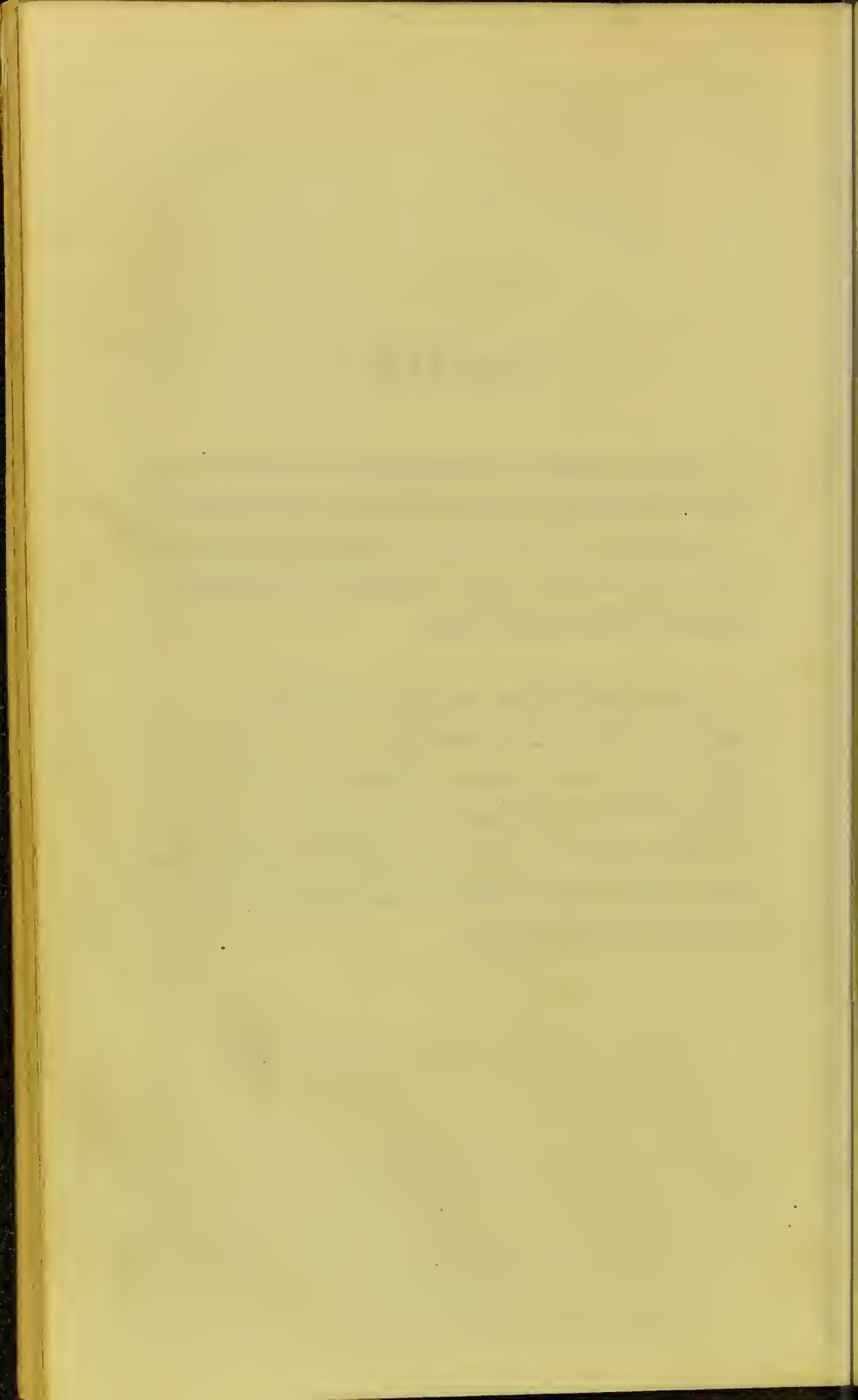T. CADELL, STRAND, LONDON.
MDCCCXXXIII.

NOTICE.

THESE Outlines of Pathology are published separately, for the convenience of gentlemen who are already in possession of the Outlines of Physiology, which I published two years ago, and which are but slightly altered in the Second Edition.

I have prefixed the same general Preface to the separate copies of the Pathology as to the entire Volume, as in some measure explanatory of the views with which the whole subject is arranged, and reduced to what seems to me a more systematic form than has been usual in recent publications embracing an equal extent of Medical Science.

CONTENTS.

PREFACE.

WHEN the former edition of these Outlines of Physiology was published, I thought some apology necessary for the publication of a new elementary book on a subject on which several very valuable and complete treatises had recently appeared ; and I stated, accordingly, that the arrangement of the subject which seemed to me the most satisfactory, and which I had followed in lecturing on it, was different from that followed in any of these treatises ; and that in conformity with views in regard to the dependence of the different functions of the living body on one another, which seemed to be legitimate inferences from the facts hitherto known, I thought it possible to give a more systematic form to the subject than had been usual in recent publications.

It does not appear equally necessary to apologise for the publication of Outlines of Pathology ; because, notwithstanding the zeal and success with which several departments of that subject have been lately prosecuted, I have felt much difficulty in recommending to Students of Medicine any single work in our language, fitted to give them a comprehensive view of the infor-

mation which it appears desirable that Lectures on
Pathology should convey.

I am aware that the term Pathology has of late
years been much employed in this country in a more
restricted sense, as nearly synonymous with Morbid
Anatomy ; and that what were formerly called Morbid
Appearances, left after any disease, are now frequently
(although with little attention to etymology), termed
Pathological Appearances.

But I do not think that this restricted sense of the
word Pathology has become so general as to make it
incumbent on all authors on the subject to conform to
it ; and, if it were to be so generally accepted, I would
beg to suggest that it would be necessary to devise an-
other more general term, as a general expression for all
the information which has been acquired regarding
the causes, the essential symptoms, the intimate na-
ture, and the consequences of diseased states to which
the human body is subject ; because it is quite cer-
tain that much important information on these sub-
jects has been acquired by observation and genera-
lization of facts, which is not obtained by, and could
not have been inferred from, any examination of mor-
bid appearances ; but which, nevertheless, falls strictly
under the denomination of Pathology, according to the
use of that term, which is suggested by its etymology,

and sanctioned by the greater number of the best authors.

The department of the Course of Institutes of Medicine in this University, which has appeared to me, as well as to my predecessors, to demand the fullest consideration, is that of Physiology ; but I have always thought it peculiarly the duty of the Professor of the Institutes to deliver a general outline of all the information which has been collected and generalized in regard to the functions of the living human body, as performed during health, as altered by disease, and as influenced by remedies.

There is at present, fortunately, no deficiency of zeal or industry on the part of the medical students in this or, I believe, in any other School of Medicine in this country ; but it seems to me that, on the one hand, the number, and the minute details of scientific medical works, are formidable and perplexing to some ; and, on the other, that individual portions of the study. which may excite peculiar interest, or promise early distinction, attract a larger share of the attention of others, than their importance in relation to the whole range of medical science, or in reference to the practical objects for which medical science is cultivated, will fairly warrant. On both accounts it seems important, that the whole extent of the studies most intimately connected

with the practice of medicine, should be fairly laid be-
fore the student, in as small a compass as possible.   It
is with this intention that the following Outlines have
been composed ; and I hope that the importance of
giving the greatest possible extent to the field of in-
quiry which is here marked out, will be admitted as
an apology for some deficiencies in filling up the de-
tails.

The objects which I have had in view, in both de-
partments of the subject, have been, first to state the
facts which appear to be ascertained, and the inferences
which appear to be fairly deducible from them, in re-
gard to the functions of the living human body, in
health and disease; and secondly, to arrange these
facts as systematically as possible, in the order in
which the functions, as existing in the living body, in
the adult state, are dependent on one another.

It is generally avowed, that the principles of medi-
cine may be expected to assume a more systematic
form as the science advances ; but it seems to me that
there is in many medical writings, an indifference to
the establishment of such general principles, both in
Physiology and Pathology, as the information we al-
ready possess sufficiently warrants ;—which argues in
attention to the value and importance of these princi-

ples, not only for the gratification of the desire of knowledge, but for securing the recollection and useful application of individual facts.

It seems to have been thought by some physiologists and pathologists, that a systematic form cannot be given to medical science, until we shall be able to give a complete explanation of all the facts which the science comprises; whereas I think we are entitled to treat the subject systematically or synthetically, if we can follow an order of ascertained dependence of the functions on one another, notwithstanding that, in many parts of the subject, we meet with facts of which the explanation is very imperfect.

It will be generally agreed, that the first important step in medical science is the separation of the phenomena of the living body from all those which are comprised in the sciences of Chemistry and Mechanics on the one hand, and of pure Metaphysics on the other; and the general acknowledgment of the necessity of referring all the facts which the human body presents, in health and disease, to laws of Vitality, exemplified in the history of other living bodies, but not in other departments of nature.

This principle was recognised in the favourite position of CULLEN, that medical science must be found-

ed on a knowledge of the " moving powers of the ani-
mal economy."   But I think it certain that CULLEN
misunderstood the nature of these moving powers in
one essential particular, viz. in supposing that the vi-
tal power of muscular parts is essentially dependent on
an influence derived from the brain.

It has always appeared to me, that the distinctions
of Organic and Animal life in general, and of the se-
veral subordinate Vital Powers or Properties, drawn by
BICHAT, formed an important step towards the forma-
tion of a regular system of Medical Science ; but some
of these distinctions are somewhat arbitrary, and the
property of Organic Sensibility in particular, appears
to have been vaguely defined, and the share of the
Nervous System in determining the phenomena re-
ferred to that head, to have been erroneously assumed.

It is not presuming too much on the accuracy of the
information which we now possess on these subjects, to
assert, that two errors have been very prevalent in ge-
neral or systematic medical works since the time that
Medicine has been separated from other sciences, and
cultivated on sound principles.   *First*, the " moving
powers of the animal economy," and especially the pro-
vince of the Nervous System in producing the pheno-
mena of life, which were long neglected in certain
schools of Medicine, have been erroneously conceived

in others ; by STAHL, by HOFFMAN, by CULLEN
and WHYTT ; and to a certain degree by BICHAT, by
LEGALLOIS, and even by Dr WILSON PHILIP ; and
were more accurately understood by HALLER, than by
any of these authors.

Secondly, besides the misconceptions which seem to
have prevailed, and still to prevail, among many physio-
logists, as to the essential conditions of Vital move-
ments, and particularly as to the influence of the Ner-
vous System in determining these movements and their
immediate effects, it seems now pretty generally ad-
mitted, that the influence of the truly Vital properties
of the Blood and other animal fluids, on many of the
most important changes of the living body, in health
and disease, has been until lately very much over-
looked. When these vital properties of the fluids are
better ascertained, and their importance duly appre-
ciated, there is every reason to believe, that the dis-
tinction so often drawn in the Schools of Medicine be-
tween Solidists and Fluidists will be effectually oblite-
rated by the admission, that most diseases originate in
that part of the system (the capillary vessels) where
the animal solids and fluids are most intimately blend-
ed together, and are continually interchanging parti-
cles ; and therefore necessarily extend to both.

These general reflections have led me to hope, that

the attempt which I have made to reduce the chief
facts of Physiology into a systematic arrangement,—
by first stating the laws and conditions of Vital Con-
tractions,—then tracing the different changes ob served
in the adult body, in the order of their dependence on
the fundamental function of Circulation,—marking the
departments of the different complex functions, in
which the Vital properties of the blood, and the truly
Vital Affinities subsisting among the component parts
of the animal frame (both solid and fluid) must be ad-
mitted as an essential part of the cause of the pheno-
mena,—and defining as accurately as possible the
powers exerted by the different parts of the Nervous
System, in determining certain of the phenomena, both
bodily and mental, which the living body presents,—
may be of some use in giving simplicity, precision, and
a scientific form, both to our knowledge in Physiology
and to its applications in Pathology.

In treating of Pathology, however, I have thought
it necessary to point out the evidence, and dwell re-
peatedly on the importance, of general facts which have
been ascertained, as to the influence of external causes
on the human body, and the morbid alterations of ac-
tion assumed by its different parts, and which could
no more have been anticipated from their healthy ac-
tion, than this could have been deduced from the ex-
amination of the mechanical or chemical qualities of

the textures composing them. And a similar observation may be applied to the study of Therapeutics.

I am very sensible that the pressure of other duties has been frequently injurious to the execution of this work ; and in the second part in particular I now regret the omission of a number of references to authorities, which would have given weight to some doctrines which may be considered as doubtful. In a text-book for Lectures this omission is, however, of no great importance, while early publication is essential to its usefulness ; and if these Outlines shall be honoured by a more general attention from the profession, I shall spare no pains to correct such deficiencies in a future Edition.

CORRIGENDA.

Page 61 line 20, *for* great nerves, *read* great veins,
—— 97 — 9, — action of blood *read* return of blood
—— 185 — 27, — moderate elevation *read* slight elevation
—— 144 — 27, — after typhoid. *insert*, The acute gangrenous inflamma-
tion of the gums and cheek, in children, called *Cancrum Oris*, is an-
other striking example of specific inflammation.

OUTLINES OF PATHOLOGY.

CHAPTER I.

PRELIMINARY OBSERVATIONS.

As the object of Physiology is to deliver the history and explanation of all the phenomena by which the living body is distinguished from the dead, so the object of Pathology is to describe and explain all the phenomena by which the diseased states of the living body differ from the healthy; and we call all states of the living body diseased, in which there are such deviations from its natural condition, as cause suffering or inconvenience, or endanger life.

A slight attention to this subject is sufficient to show, that there are many facts in regard to the operation of external causes on the human body, and the modes of diseased action assumed by its different organs, which could not possibly have been inferred from our knowledge of the structure and healthy action of parts; which are made known to us only by observation of the diseased conditions of the body themselves; and can only be properly generalized by an induction strictly confined to this department of knowledge.

The first step in this induction is the classification of individual cases of disease into Genera and Orders, according to the resemblances which their symptoms, observed during life, bear to each other. Those cases which appear the most closely analogous are carefully observed, and their

usual history and terminations ascertained; a selection is made from these histories, of the symptoms which appear the most characteristic, and are observed the most uniformly, to form the definitions, (*i. e.* abridged descriptions) of genera of disease; and from a number of such definitions, a farther selection is made of certain sets of symptoms, which are stated as characterizing a class or order of genera.

This process, of the description and nosological arrangement of diseases, was necessarily begun, and carried to a high degree of perfection, for practical purposes, before any considerable progress was made in the investigation of the intimate nature of the changes which take place in the living body, whether in health or disease.

When the characteristic symptoms and usual history of a disease are accurately fixed, the principles of Physiology, enabling us to understand what functions of the body are disordered, in what manner they are altered, and how their alteration affects other functions, suffice for the explanation of many of the phenomena of that disease. The nosological characters, and observed symptoms of diseases, enable us, therefore, to go so far in their Pathology. And there are some diseases, which do not necessarily cause any change in the structure of the body, and the explanation of which can hardly be sought in any other way than this.

But that the explanation of the phenomena of disease thus obtained is necessarily very limited and imperfect, appears from the following considerations.

1. The variety of individual cases of disease being in fact infinite, and the rules by which they are classed into orders and genera being for the most part arbitrary and artificial, it very often happens, that a case which, in some of its symptoms, resembles one set of other cases, (and is therefore necessarily classed along with them under the same title), in others of its symptoms bears an equally important resemblance to others, in different parts of the Nosology.

There are, therefore, many combinations and successions of symptoms, which it is important to study (both for

theoretical and practical purposes) besides those on which the arrangements of classes and genera are founded ;—such are those which we express by the terms, Tendency to Syncope, to Coma, or to Asphyxia,—typhoid tendency,—inflammatory tendency,—nervous irritability,—gastric derangement,—putrescent diathesis, &c. which are often observed in the course of many different diseases. When we attempt the explanation of deviations from the healthy state of the body, these morbid states, often common to many cases which are otherwise very dissimilar, claim attention equally as the histories of diseases distinguished by the nosologist, and it becomes obvious, that the science of Pathology cannot be limited by these arbitrary distinctions.

2. When the changes in the structure of the body that take place in the course of diseases, are examined during life, and more especially after death, it appears that different combinations of symptoms are often apparently excited by the same fundamental diseased action, and consequently found in connexion with the same alteration of organic structure; and again, that very different alterations of structure may be attended, in different individuals, by symptoms the greater number of which are very nearly the same.

These last facts have led many inquirers into this department of Nature, to look on organic changes of structure, apparent in the dead body after disease (and which are subject to less variety, and more easily described and arranged than the symptoms of diseases) as the only sure basis of all pathological discussions; and the accurate description and arrangement of these has been regarded too exclusively by some as the main object of Pathology, which is thus rendered nearly a synonymous term with Morbid Anatomy.

But the following considerations seem sufficient to shew, on the other hand, that the study of organic lesions, although an essential, can form but a small part of a rational and useful system of Pathology.

1. There are very numerous cases, arranged into different genera of disease, some of them important, and even

rapidly fatal, *e. g.* different forms of fever, certain cases of
apoplexy, and of syncope, tetanus, &c. which do not uni-
formly or necessarily leave behind them, so far as is yet
known, any alteration of textures, or other change, per-
ceptible to the anatomist; the Pathology of which diseases,
therefore, although it may derive assistance from, cannot
possibly be founded on, the knowledge of morbid appear-
ances.

2. In many cases of disease, where decided alterations of
structure are found after death, these cannot be connected
with the fatal event, and do not furnish a rational expla-
nation of it, without reference to general facts or princi-
ples, known to us simply by the previous observation of
disease, and by generalization of facts which that study pre-
sents. It is only by such observation that we learn, that
a certain amount of inflammation on the peritoneum fur-
nishes an adequate explanation of fatal depression of the
heart's action; or even, that a certain extent of ulceration of
the lungs is sufficient to explain a wasting hectic fever*. In
such cases it is obvious, that the laws, according to which
such lesions become injurious or fatal, as they cannot be
deduced from the study of the lesions themselves, demand
a separate investigation.

* Jouent-elles un role important dans l'economie animale, les mem-
branes sereuses qui tapissent quelques visceres ?   Leur lesion trauma-
tique est-elle immediatement mortelle, comme l'est par example celle de
quelques parties de l'encephale ?   Certainement non ; et pourtant voyez
les suites qu'entraine leur inflammation.   Serait ce l'injection de leurs ca-
pillaires qui aurait donné la mort ? Serait ce la couche de lymphe coagula-
ble qui tapisse la surface lisse de ces membranes ?   Qui le croira ?   Il y a
donc encore autre chose dans ces cas que ce qui tombe sous les yeux.
Il y a, independamment des elemens materiels, un agent vital à signaler
et etudier.   Et neanmoins que trouve t'on dans les ouvrages d'anatomie
pathologiques d'ailleurs si justement estimés ?   Les recherches les plus
precieuses sur l'etat des tissus, l'examen le plus scrupuleux de leurs pro-
prietés physiques et chimiques, le rapprochement le plus exact des phe-
nomenes de la maladie avec les alterations organiques ; mais peu de conside-
rations physiologiques sur la pathogenie de ces derniers.   Or, il est tres
essentiel de s'occuper de ces considerations, à fin de donner à tons ces
travaux le complement qui leur manque.—LOBSTEIN, Traité d'Anatomie
Pathologique, liv. i. §. 299.

3. Even in those cases where the morbid structures that are ascertained to exist before death or found after death, easily and satisfactorily explain the symptoms in the latter stages of the disease and the death of the patient, it is obvious that these alterations of structure must themselves have resulted from *previous diseased actions*, *i. e.* that every disease must necessarily have been one of *function*, before it could become one of *structure*. The main object of inquiry is into the essential conditions and intimate nature of these diseased actions; and although all the information we can acquire in regard to them is necessarily limited, and liable to various sources of fallacy, yet the study of the diseased structures, which are their effect and indication, has little value, either with a view to Pathology or to Practice, except in so far as it tends to give some insight into the nature of the diseased actions themselves.

These considerations are sufficient to shew that Pathology, or the study of diseases, cannot be made to assume the form of a science, without careful investigation, and reference to general laws, 1. Of those morbid actions which produce no lesions of structure; 2. Of those which precede, and cause such lesions; and, 3. Of those which are produced by, and succeed such lesions, or attend their formation.

It thus appears, that neither the study of Physiology, the study of symptoms as they appear during life, nor the study of organic lesions discoverable after death, is sufficient in itself to enable us to deliver the history and explanation of the phenomena of disease; but that information from all these sources must be collected and combined for this purpose.

There is, farther, a very important subject of inquiry, which forms part of Pathology, but requires a separate induction of facts, and a different kind of evidence, viz. that which relates to the remote Causes of Diseases, or the external conditions necessary to their production; and which are ascertained chiefly by comparative observations, on large numbers of individuals, becoming affected with particular

diseases under certain circumstances or conditions, and escaping them under others.

When all the information obtained by these different inquiries is collected and generalized, it naturally leads to the determination of certain ultimate facts, or laws in this department of Nature; according to which, under the influence of certain external causes, the different textures and organs of the living body undergo particular alterations of their vital action, and thereby derange the other vital actions of the system. The fewer, and the more comprehensive, these ultimate facts, the more successful must the induction be regarded.

Some of these laws have been already so far ascertained as to enable us to treat the subject in some measure *synthetically*.

The simplest exemplification of these ultimate facts in Pathology is to be found in cases of sudden death, and in the action of violent injuries; and we therefore premise a short account of different fatal injuries, to discussions on the Pathology of any diseases.

CHAPTER II.

OF THE ACTION OF CAUSES OF SUDDEN DEATH.

THESE have been already in some degree under consideration, as illustrating the importance, and dependence on one another, of the different functions; but the effects produced by the most powerful external agents on the functions which they especially affect, could not have been inferred from our knowledge of the natural actions of the body, and must be regarded as ultimate facts,—to which reference may be afterwards made in attempting the explanation of the more complex phenomena of disease.

The action of all causes of violent or sudden death may

be referred ultimately to two modes of injury, which are in some cases perfectly distinct, although in others they are evidently blended. We cannot, indeed, arrange the causes of violent death strictly according to these differences in the mode of their action, because the same causes appear to act, under different circumstances, sometimes chiefly in the one way, and at other times in the other; but we can point out that their fatal effects are always produced, either by their *directly depressing or suspending the vital action of the organs of circulation,*—or else, by their *obstructing the arterialization of the blood,* and therefore, according to principles formerly stated, *arresting the circulation at the lungs.*

We know farther, that the first effect, or what may be called in general *death by syncope,* or beginning at the Heart, may be produced in two ways : 1. By a cause acting on the system after the manner of a Concussion or shock, depressing the vital powers by which the blood is moved; 2. By abstraction, sudden or gradual, of the vital stimulus ;— and that the second effect may be produced also in two ways, 1. By injury of the Nervous System, arresting respiration through the intervention of insensibility, *i. e.* producing *death by Coma,* or beginning at the Brain ; and, 2. By direct impediment to the access of air to the lungs, producing what is strictly called *death by Asphyxia,* or beginning at the Lungs.

To these principles we can ascribe the known effects of the following kinds of injury; and having illustrated these, we may afterwards refer to them with advantage, as the facts most analogous to the changes that constitute disease, and especially to those circumstances of disease which are immediately dangerous to life.

I. It is to be expected, from what we know of the functions of the Nervous System, that Injuries affecting it should impair, more or less completely, the sensations, the mental powers, and the voluntary motions; but they become dangerous to life only in the ways already specified, inasmuch

as they affect the fundamental function of Circulation, either directly, or through the intervention of the Respiration.

1. The most violent injuries, affecting the Nervous System, suddenly arrest, or greatly impair, the motion of the blood in all parts of the body, i. e. they produce a state of Syncope or faintness; the heart's action either suddenly ceasing, or becoming very feeble; the pulse small, or imperceptible, and the surface cold; at the same time that sensation and voluntary motion are suspended immediately after them. This direct effect on the circulation of violent injuries of the brain was overlooked by BICHAT, but is well illustrated by Dr WILSON PHILIP; and has long been known to practical men, as constituting the most characteristic part of the first symptoms of general concussion of the brain, as distinguished from more partial compression of it.

The experiments of LEGALLOIS and Dr WILSON PHILIP farther shew, that this effect on the heart's actions, and on the motion of the blood in the capillaries, may result from injury of any part of the brain or spinal cord, if it extend to large portions of the nervous matter; and many examples inform us, that when concussion is general over the whole system, it is frequently fatal, in this way, without any visible disorganization being produced.

After death from affection of the nervous system, thus directly influencing circulation, the heart is sometimes found, especially in the most sudden cases, quite empty of blood (the cause of which appearance is doubtful), in other cases distended; but with no decided difference as to the quantity of blood in its right and left sides.

In cases of this kind it is not quite certain, that the fatal depression of the vis vitæ in the circulating system is the effect of an impression made on the nervous system; and some have supposed, that such injuries are fatal by a direct effect on the smaller arteries, checking the circulation in them so completely, as to throw a burden on the heart which it is unable to overcome. But the effects of violent injuries confined to the brain or spinal cord, as in the experiments of WILSON PHILIP and LEGALLOIS, are just

similar to those of a general concussion; mental causes, of powerful operation, which certainly act through the nervous system, have just the same effect; partial although violent injury of other textures has no such effect; nor does such an effect result from suddenly stopping the flow of blood in several large arteries by ligatures, or by amputation of a large limb; and therefore it is highly probable, that general concussion of the body does act, as is generally thought, on the vascular system through the intervention of the nervous; and this is one of the facts included under the general statement formerly made, that the nervous system, although not necessarily concerned in the functions of organic life, is yet so connected with them, that by certain changes in it, any of these functions may be variously altered, or even totally suspended.

There is great variety as to the amount of injury which will produce, in different individuals of the human species, the sedative effect on the circulation now in question; and as to the duration and termination of that sedative effect, which sometimes abates quickly, and sometimes gradually increases till it is fatal, some hours after the injury.

There appears to be a variety also, in the part of the circulation chiefly affected by such injuries. In some instances the circulation on the surface appears to fail, and the heat of the surface is reduced much more than in others, where the heart's action is equally depressed. In experiments by Chossat, the heart's action was for some time little affected by certain injuries of the brain, which checked the circulation in the capillaries so completely, as to suspend the secretions and the evolution of heat. When the spinal cord has been severely injured in the human body, below the neck, the circulation in the capillaries has generally appeared, for some time, more affected than the heart's action, although it is by gradual failure of the circulation that such cases are ultimately fatal.

There is also great variety in the alterations of the functions of the Nervous System itself, which result from such injuries, and accompany or succeed the sedative effect

on the circulation. In some cases the coma is long con-
tinued and profound, in others transient; in some cases
it is attended by much convulsion, in others by little or
none ; in some cases it is succeeded by much headach, or
by general or partial amentia or delirium, or by incessant
nausea and vomiting; and in others by none of these.
And it is certain that all these varieties in the symptoms,
in such cases, may be independent of any perceptible al-
teration of the structure of the nervous system *.

It is an important fact, that when injuries that have af-
fected the Nervous System, and through it the circulation,
in the manner now stated, are not quickly fatal, but are fol-
lowed by the slower processes, to be afterwards described, of
inflammation and fever, the progress of these is frequently
observed to be modified by the preceding or accompany-
ing state of the system, likewise consequent on the injuries;
and that in these circumstances fever is apt to assume the
form to be afterwards described as *typhoid*, and inflamma-
tion to terminate rapidly in gangrene †.

2. A slighter, and especially a more partial injury of the
Brain, or upper part of the Spinal Cord, if its action be of
sufficient intensity and duration, is adequate to produce
death in a totally different way, viz. by Coma or stupor,—
" superstite actione cordis et arteriarum." The essential
peculiarity of this kind of fatal effect of an injury of the
Nervous System is, that Respiration takes place imperfectly,
and ultimately is suspended, by reason of the defect of sen-
sation ; and in the cases which are characteristic examples
of this mode of death, the circulation, and sometimes the
animal heat, not only continue entire up to the moment
when the last breath is drawn, but even survive the respi-
ration for a short time ; during which time, of course, ve-
nous blood moves along the arteries; but the venous blood
soon ceases to make its way through the capillaries of the
lungs, and the circulation is therefore brought to a stand.
(See Outlines of Physiology, p. 152.)

* See BRODIE, Medico-Chirurgical Transactions, vol. xiv.
† See particularly TRAVERS on Constitutional Irritation.

The experiments of many physiologists shew, that it is in this way only that death is produced when the spinal cord is cut in the upper part of the neck, or the head cut off, without violent hæmorrhage, and without any large portion of the brain or spinal cord being crushed.

The most common injuries of the nervous system which cause death, thus preceded by Coma, are those in which there is partial compression of the nervous matter, as by depressed bone, or effused blood, pus, or serum; but it is in the same way that death is often produced by disorganizations of the brain, which do not necessarily imply compression of its substance; and also by certain poisons, the effect of which on its functions does not appear to depend on alteration of the pressure on it; and it is therefore incorrect to speak generally of such symptoms as indications of pressure on the brain.

We know from Physiology, that the part of the Nervous System which must be especially affected in these cases, where the failure of respiration is the immediate cause of death, must be at the sides of the medulla oblongata; but the part visibly injured is often considerably distant from this.

There is very great variety as to the duration and degree of the insensibility, which precedes the failure of respiration in such cases of injury of the Nervous System; and as to the other affections, either of the brain and nerves, or of other organs, which may attend that insensibility, such as headach, delirium, somnolency, spasms, palsy, dilated or contracted pupil, preternaturally slow, or frequent, or irregular pulse, &c. Even the function of respiration itself is variously affected in different cases of the kind, being sometimes hurried and imperfect, and in other cases unnaturally slow and deep, for some time before it is finally suppressed. After the death thus produced by injuries of the Nervous System, just as after death by asphyxia, the blood is found accumulated chiefly in the lungs, pulmonary artery, right side of the heart, and great veins.

These two modes in which injuries of the Nervous System

may cause death, though perfectly distinct in some cases, are evidently combined in others; the same cause both instantly weakening the heart's action, and likewise deadening the sensibility, so as gradually to suppress the action of respiration. And there are many cases of injury of the head, where insensibility and faintness from the concussion immediately succeed the accident, but quickly abate, and are succeeded after an interval by insensibility with full pulse, and death in the way of coma; which may then be confidently ascribed to compression of the brain by effused blood or serum.

There are various causes, physical and mental, which affect the Nervous System, nearly in the manner of a Concussion, and are apt to produce a similar depressing, and sometimes dangerous, effect on the circulation, and the operation of which is illustrated by the facts now stated, as to the effects of mechanical injuries. One of these is, a sudden diminution of the pressure, to which the brain and spinal cord had been previously subjected. Thus, when a depressed piece of bone, or a coagulum of blood, or a quantity of serum, which had long rested on a portion of the brain, has been removed, insensibility, and along with it sudden feebleness of circulation, have often ensued. When a large bloodvessel has given way in the head, and poured blood into the ventricles (implying, in the first instance, a sudden diminution of the pressure on a part of the nervous matter), a similar result has often been observed; and been followed in both cases by a partial recovery of sense, and of pulse, and then by gradual accession of fatal coma, as the effused blood has increased in quantity and compressed the brain around it *. The sudden attack of insensibility, and sudden depression of the heart's action, which may often be determined by the erect posture during bloodletting, or by rapidly removing the fluid of ascites without substituting artificial compression, must likewise be ascribed to sudden diminution of the pressure on the brain, acting after the manner of a concussion; and are illustrated by the

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* See ABERCROMBIE on Diseases of Brain and Spinal Cord, p. 228. *et seq.*

attacks of syncope, with suspension, or great diminution, of the motion of the heart, which are often produced by rising suddenly after long stooping.

Another cause, which many persons have thought adequate to produce such an effect on the Nervous System as shall act as a concussion, is the impression made by a cannon ball, or other large substance passing with immense velocity close to the head.

A cause certainly adequate to produce fatal depression of the heart's action, and which no doubt acts through the Nervous System in like manner as a concussion of the brain, is a violent blow on the abdomen, especially on the epigastrium, which has been supposed to act immediately on the great semilunar ganglion. A draught of cold water taken when the body is heated and exhausted by fatigue, has in some cases been instantaneously fatal in the same manner ; and the concussion from a violent and extensive wound of any part of the abdomen is usually fatal in the same rapid way, independently of hæmorrhage, and before there is time for inflammation to be established. These facts are important, as illustrating the more gradual, but very dangerous depression of the power of the heart, which is seen even in the earlier stages of inflammation of the abdominal viscera.

Violent injuries of various other parts of the body, especially if inflicted on a person of weakly habit, and in whom the nervous system is in a state of unnatural excitability, (as from the habitual use of opium or spirits) may equally act on the footing of a concussion, either causing sudden death, or so depressing the actions of the vascular system, as to give the typhoid form to the fever, and the gangrenous tendency to the inflammation, which are to result. This has been observed from severe surgical operations, and from extensive lacerated wounds, and bad compound fractures of various parts, even although there had been no general concussion of the body, nor insensibility immediately after the injury *.

* See TRAVERS on Constitutional Irritation.

In the cases last mentioned, it can hardly be doubted that the violence, or peculiar nature of the Sensation, which attends the injury, is the intervening link through which the vital action of the heart is sympathetically affected; and accordingly, we have many facts to prove, that various violent and overpowering Sensations, or those corresponding Emotions of mind, as Joy, Grief, Anger, Fear, when acting in the utmost intensity, affect the circulating system just as a concussion does, and sometimes with fatal effect,—especially when they take place in persons in a state of unusual weakness or exhaustion.

II. The effect of very intense Heat, applied to a pretty large surface of the body, as in an extensive burn, or to the whole body, as in the case of a *coup de soleil*, is also quite similar to that of concussion; there is often insensibility, and always, when the case threatens the most immediate danger, there is the characteristic depression of the heart's action; and when recoveries take place from the state of collapse (as it has been called) immediately succeeding such injury in its extreme degree, it is often under the use of stimulating remedies *.

But intense heat of the sun, in other circumstances, especially, as it would seem, if acting on a stronger habit of body, and when there is less exhaustion by muscular exercise, has often produced a state of insensibility, in which the pulse has been fuller than natural, and the vessels of the head unnaturally turgid, and which has either been fatal in the way of coma, as above explained, or been relieved by copious evacuations, and cold applications; and the same cause has often produced other diseased conditions connected with a derangement of the action of vessels of the head †. In this case, the most injurious effect of the heat is evidently on the vascular system, exciting the action of the heart, and probably expanding the blood in the vessels; and the brain suffers probably from increased

* See TRAVERS, l. c.
† See MITCHELL in Edinburgh Medical and Surgical Journal, 1828.

compression by the blood; whereas in the former case, the first and chief effect of the heat appears to be on the nervous system, and the heart suffers from the violent impression made there.

III. It appears from experiments on animals, by FONTANA, HUNTER, and BRODIE, and also from cases observed in the human body *, that the effect of Lightning or Electricity, when acting with the utmost intensity, is likewise similar to concussion, depressing or even extinguishing the vital action in the vascular system, at the same time that it causes insensibility; but that when acting in a less intense degree, it produces insensibility without any such immediate sedative effect on the circulation,—that this appears often to be connected with turgescence of the vessels of the head, and probably expansion of their contents; —and that it may terminate in death by coma, or be followed by partial and more permanent injury of some of the functions of the brain and nerves.

IV. The effects of Cold on the body are remarkably various, according to circumstances formerly briefly noticed. They depend, not so much on the degree of cold that is applied to the body, nor even on the degree to which the body is actually cooled,—as on the rapidity of the change, and probably on the intensity of the sensation thus excited. Thus it was found by CHOSSAT, that the temperature to which the bodies of animals killed by cold had been reduced before they died, was considerably various, and always higher, as the reduction of temperature had been more rapid, and therefore more injurious. And the degree of effect of any cold applied to the living body has always been observed to be greater, as the sensation it excites is the more intense and the more lasting; and therefore to be increased by all circumstances, either of the body which undergoes the ex-

* See, e.g. PARKINSON in Memoirs of Medical Society in London, vol. ii.; and MACAULAY in Edinburgh Medico-Chirurgical Transactions, vol. ii.

posure, or of the degree and mode of the application of the cold, by which the intensity and duration of the sensation are increased.

When cold is applied in such circumstances as to take full effect on the body, it has been commonly stated that it becomes dangerous by inducing stupor, and ultimately death in the way of coma. This effect of cold has often been observed, and has sometimes been preceded by delirium, has sometimes been attended by hæmorrhage from the nostrils or ears, and has been found, on dissection, connected with considerable serous effusion in the head. It is therefore probably in a great measure dependent on the greatly diminished flow of blood to the surface and extremities, and proportionally increased flow to the brain. Persons recovering, by assiduous application of heat, from this state of stupor, produced by cold, have continued comatose for hours after the circulation in their extremities has been well restored *.

But in those who become comatose from cold, the heart's action is at the same time enfeebled; and it appears distinctly, from experiments on animals, and observations on the human body, that the most intense cold may be fatal in the same way as a concussion, by a direct depressing effect on the circulation; in which case, of course, respiration continues up to the moment when the heart's action ceases, —the heart is found motionless, and with arterial blood in its left cavities immediately after death,—and the artificial respiration is quite ineffectual in prolonging life †.

In all cases, cold acts as a sedative power on the capillary circulation on the surface ‡, and Dr Edwards found that its repeated or long continued application has a peculiar effect in depressing the power of subsequently generating heat. In some instances of frost-bite this effect is so

* See, e. g. Kellie in Edinburgh Medical Journal, vol. i. p. 304.

† See Chossat, Mem. sur l'influence du Systeme nerveux sur la Chaleur Animale, p. 8.

‡ Beaupré, on the Effects of Cold,— translated by Clendinning, p. 131.

powerful on the parts to which it is chiefly applied, as to put a final stop to all vital action in them, even when the system at large does not materially suffer; and in many cases, the sedative effect on the vital actions of frost-bitten parts is such, that the inflammation, (which is always excited in a greater or less degree by the return of heat to such limbs) shews evident marks of deficient reaction, and tends rapidly to gangrene.

But such effects of intense cold on the vital actions of *individual parts*, must be carefully distinguished from the ease of cold acting as a powerful sedative on the *whole system*; because in the first of these eases, when the general circulation is strong, the chief danger is from the inflammation, which is the direct consequence of the restoration of the circulation and natural heat of the part; and this is chiefly to be moderated by causing that restoration to take place very gradually, therefore chiefly by cold applications tending to retard it; whereas when the vital power of the whole system has been depressed, there is no such risk of local injury from the restoration of temperature, and external heat and other stimuli may be much more freely ap · plied.

V. In regard to the action of Poisons on the animal economy, there are several questions of much importance, to which it is the more necessary to advert, as these phenomena are more analogous to the changes which take place in some of the most malignant diseases, than any others to which we can refer for illustration of these diseases.

1. It has been long a subject of inquiry, whether it is essential to the action of poisons, that they should be absorbed into the circulation, and carried with the blood over different parts of the system, or whether their action may be on the nerves of the parts to which they are directly applied, and the affection of the organs more necessary to life be produced sympathetically.

That the peculiar agency, and even the fatal effect of some poisons, may be produced in this last way, appears distinctly,—

a. From the very great rapidity of the action, *e. g.* of the oil of bitter almonds, and still more, of the hydrocyanic acid, the application of which to the tongue of an animal, has been followed by death within eight, five, or even three seconds, certainly before it can have reached in the way of absorption and transmission along the vessels, the heart, on which organ its fatal effect is mainly exerted.

b. From the suddenly fatal effect of concentrated acids and alkalies taken into the stomach, which disorganize the mucous membrane there so completely that they cannot be absorbed from it ; but when in that concentrated state produce death much more rapidly than they do, when so far diluted that their absorption is easy *.

c. From the effect of many poisons, such as Opium, Belladonna, Aconite, Hydrocyanic Acid, having often been observed to take place, chiefly in parts in the neighbourhood of that to which they are applied, and not merely in the course of the blood passing thence to the heart.

d. Perhaps also, from the effect of a poison lodged in the stomach, having often been observed very rapidly to abate, as soon as it was discharged by vomiting.

But there is abundant evidence, that in a great majority of cases of poisoning, the effect produced is subsequent to the absorption of the poison into the blood, and to its transport, in the blood, from the point where it is applied, to other parts of the system.

The numerous experiments of FONTANA, MONRO, BRODIE, MAGENDIE, FODERA, CHRISTISON, COINDET, and BARRY, leave no room for doubt, that poisons inserted into wounds, or laid in contact with internal membranes, are quickly absorbed into the blood; that the passage of the venous blood, from that point towards the heart, is in most cases the only condition essential to their action ; and that

* CHRISTISON on Poisons, p. 6.

such a diminution of atmospheric pressure on the surface where they are placed, as shall prevent their absorption, will also prevent, or even suspend, their action.

But it is not so clear, to what distance from the point of its application a poison must be transported by the blood, in order to produce its full effect. The experiments of Dr ADDISON and Mr MORGAN have shewn, that a poison introduced into a large vein will act, notwithstanding that its direct access to the heart is obstructed,—that a poison introduced into the femoral artery will act as rapidly as one introduced into the jugular vein, or carotid artery;—and again, that when the blood from the carotid artery of one dog is sent to the brain of another, a poison may be applied to a wound in the first dog, and take full effect on him, without affecting the second. But these results do not seem sufficient to authorise the conclusion which they have been thought to support,—that the sole direct action of poisons is on the nerves of the vessels, and their action on the brain or heart only sympathetic *. It still appears much more probable, that the greater part of the effect of poisons, which have been absorbed into the blood, is consequent on their direct application to the more important vital organs.

Some poisons taken into the blood have been detected there, and the action of some has been observed to be attended by a change of the sensible qualities of the blood; and especially by a diminution or loss of its coagulating property; but many act fully without altering its sensible qualities; when these are altered, it is doubtful how far the alteration is connected with the action of the poisons on the living solids; and the loss of coagulating power is so often seen in cases of sudden death, that of itself it gives no information as to the immediate cause of death. It is very important to keep these cautions in mind when

* The last experiment gives no information as to the mode in which poisons circulating in the blood affect the body. Experiments by VERNIERE (Journal des Progrès des Sciences Medicales, t. iii.) shew, that blood *strongly* impregnated with a poison, may be transfused from one animal to another, and produce its usual deleterious effects.

we apply the analogy of poisons to the elucidation of malig-
nant diseases. They shew that although the blood be
changed by the agency of the causes of these diseases, it
does not necessarily follow that that change is concerned
in producing the most essential symptoms, or the fatal
event.

2. Another question which has been started on this
subject is, whether the action of a poison, that has been
absorbed into the blood, on the circulation itself, is to be
ascribed to its direct contact with the heart and vessels, or
in a great measure to an influence transmitted to them
from the nervous system, which it must necessarily also
pervade. On this point all that can be stated is, that we
have clear evidence of the noxious effect of many poisons
on moving solids to which they are directly applied, (e. g.
on those of the fibres of the heart or intestines with which
they are laid in contact)', or even on vegetables; but never-
theless, as we have seen that the action of all parts of the
circulating system in animals is subjected to an influence
or control, from changes taking place in their nervous
system, it is quite possible, that the agency of poisons,
circulating in the blood, on muscular organs, and especially
on the circulation, may be in part consequent on the im-
pression which they make on the brain and nerves. And
the *order of the symptoms* in the case of some such poisons,
as the oxalic acid, would seem to denote that the primary
effect is on the brain and spinal cord, and that the heart
suffers secondarily.

3. The action of the different mortal poisons clearly
exemplifies two of the modes in which it has been stated,
that sudden death may be produced, *i. e.* the death by Co-
ma, and the death by Syncope. Although some poisons
appear to act peculiarly on the lungs, none produce sud-
den death strictly in the way of Asphyxia.

a. Those which are called the Narcotic poisons, affect
especially the nervous system ; and when acting in full

force, produce the state of Coma, and death strictly in the way of coma, already described, the circulation continuing, sometimes even tolerably strong, after the last breath is drawn, and then coming to a stand, because the respiratory movements are suspended, and the blood continuing venous, stagnates in the vessels of the lungs.

This ultimate effect of these poisons is preceded in different cases, just as the ultimate fatal effect of injuries of the brain is, by various affections of the nervous system, Delirium, Convulsions, Vertigo, loss of different of the external senses, &c.; or it may take place gradually, without any of them. After it, the blood is found accumulated in the great veins, and on the right side of the heart, and the left is nearly empty.

That this is the immediate cause of death in such cases, appears most clearly from the experiments of Mr Brodie *, to which reference was formerly made; in which the circulation was maintained by artificial respiration, after the natural respiration had been suspended by the action of such poisons, until the impression which they had made on the nervous system had subsided, and the sensibility, and therefore the natural respiration, were restored; and the animals recovered from apparent, and what would otherwise have been real, death.

It is thus that, according to these experiments, alcohol, the essential oil of almonds, and tobacco, the juices of the aconite, and the woorara poison, produce death; and the same is evidently the full and perfect action of opium, hyoscyamus, camphor, conium, and other medical agents commonly called Narcotics.

But although the chief agency of these poisons is on the sensorium, *i. e.* on the brain, yet it is to be observed, that they all appear more or less to weaken, and often may irretrievably depress, the action of the heart likewise, and not merely by reason of their effect on respiration. And although there is one case, already quoted, on record, where

* Phil. Trans. 1812.

the fatal effect of opium on the human body was arrested by the artificial respiration, after the natural had failed; yet, in general, the pulse becomes so feeble, the skin so cold, and the vital actions in the capillary vessels are evidently so much impaired, under the influence of large doses of opium, before the respiration comes to a stand, that there is little ground for expecting that their fatal effect can often be arrested, even by this means, at so late a period.

b. There are other poisons, the fatal effect of which is evidently exerted on the heart only, and which cause death merely by Syncope,—preceded by feebleness and often irregularity of pulse, by coldness, tremors, and failure of muscular power, and often by rigors, nausea, and vomiting, or by convulsions, as happens in many other cases of syncope. The unequivocal indications of this kind of death are, that the respiration continues as long as the action of the heart; and that the heart is therefore found, immediately after death, motionless, unexcitable by stimuli, and filled with venous blood on the right side, and arterial on the left, as in a living animal. It was thus that in the experiments of Mr BRODIE, death was produced by the upas antiar, and by the infusion of tobacco; and the fatal effect of full doses of hydrocyanic acid, digitalis, strychnia, oxalic acid, arsenic, preparations of antimony, and of baryta, various animal poisons, &c., appears to be of the same kind, although these poisons have a more complex operation, and affect a greater variety of organs.

c. There are some vegetable, and many mineral poisons, which excite Inflammation, chiefly in the mucous membrane of the primæ viæ, but in some instances in other parts; and the symptoms of these inflammations (although rarely the sole effect of the poisons) blend themselves with those which proceed from the direct agency of the poisons on the nervous or vascular system, and in some instances the inflammation excited causes death, in modes to be afterwards considered. It is thus that many metallic, and some

saline and earthy substances, and the different vegetable and animal earths, are dangerous or fatal.

d. In some cases, the effects of poisons introduced into the system take place slowly, and last much longer, and are usually regarded simply as diseases, sometimes not to be distinguished from diseases which may be excited by other means, and implying a similar danger; as when arsenic produces epilepsy, lead colic and palsy, when the ergot of rye causes a peculiar kind of inflammation of the limbs, ending in dry gangrene, or different kinds of vegetables or fish, urticaria.

The Gases which act as poisons illustrate sufficiently these different modes of action; chlorine, or nitric or muriatic acid gases, producing bronchial inflammation; carbonic acid, or pure oxygen, acting as a narcotic; and air itself, if introduced into the blood in any quantity, suspending the circulation, by the very peculiar manner in which it affects, and quickly stops, the actions of the heart.

But although these different kinds of injurious or fatal action of poisons may be clearly distinguished, yet it is impossible to classify poisons strictly by their mode of action, because it is certain that the agency of almost all poisons is complex; and that according to varieties of the dose, or mode of preparation, the same poison, on different occasions, may cause death in different ways, oxalic acid, *e. g.* in full doses, acting directly on the heart, but in smaller doses chiefly on the nervous system; the essential oil of tobacco acting strictly as a narcotic, while the infusion of the leaves affects the system chiefly by its powerful sedative effect on the heart; and arsenic, when taken in large quantity, producing its fatal effect on the heart, before there is time for the inflammation to be established, which constitutes the chief danger to be apprehended from smaller doses of the same poison.

These statements are sufficient to illustrate the various intentions with which our scientific knowledge of the action of poisons demands that remedies should be applied to that action.

VI. In regard to the effects of dangerous or fatal *Hæmorrhage* in the living body, the following seem the most important facts.

1. When the hæmorrhage is very gradual, all the indications of failure of the circulation may come on,—the feebleness of muscular action,—the paleness and collapse of the countenance,—the coldness beginning at the extremities, —the cold sweat beginning on the face,—and the pulse may become imperceptible; without the senses, or the intellect, being impaired, and a slightly laborious or heaving respiration may be almost the only indication of injury of the nervous system up to the moment of death. Such perfect endurance of the functions of the nervous system, attending irretrievable depression of the powers of the circulation, is still more remarkably seen in some fatal diseases, where the heart's powers are depressed sympathetically in consequence of disease of other parts, than in cases of hæmorrhage where the vital stimulus is gradually withdrawn.

2. A more sudden and violent hæmorrhage affects the nervous system much more speedily, just as we have already seen, than any other means of suddenly diminishing the pressure, to which the brain had been subjected, does; —and the impression thus made in the brain *reacts on the heart after the manner of a concussion,* and causes its action to fail much sooner than it would have done, merely by reason of the loss of blood. It is only in this way that we can explain the fact, that in bleeding from a large orifice, and in the erect posture, not only sensation, and the other functions of the brain are sooner suspended, but *the heart's own actions fail,* with much less loss of blood than when the orifice is smaller, and the patient lies horizontally, so that the diminution of the pressure on the brain is less, and more gradual.

In this manner death may be produced, certainly in much less time, and probably with less loss of blood, than by a more gradual hæmorrhage; and in such a case, the greater affection of the nervous system is shewn, sometimes by transient delirium, often by nausea and vomiting, and very generally by insensibility, and by more or less of

spasms or convulsion, often repeatedly occurring before death. These two distinct varieties of the violent death by syncope, are important to be remembered in speculations on the fatal tendency of several diseases.

3. The loss of blood, especially if frequently repeated, has, on many constitutions, especially in women and children, a subsequent effect, which could not have been anticipated *a priori*, of increasing the excitability of the vascular system (whether by reason of the impression made on the nervous system or not is doubtful), and so leading to a state of the system described as Reaction after the loss of blood, or as Prostration with Excitement; in which, especially if any cause of febrile excitement at the same time exist, there is a fallacious degree of strength and frequency of the heart's action, when the other vital actions are feebly performed, and farther evacuation is dangerous *.

The transfusion of healthy blood, of the same species of animal, into the bloodvessels, may be effectual in arresting the fatal effect of hæmorrhage, not only when the power of the heart is rapidly sinking, but even after the heart's actions have come to a stand from this cause, but probably only within a few seconds after that time †.

VII. It was already stated, that in the case of death by *Fasting*, more or less of inflammation of mucous membranes is excited, apparently by reason of the deficiency of the natural protecting mucus; and probably in connexion with this inflammation a febrile action is established, which renders the case more complex than it would have been, if all the symptoms had depended simply on the gradually diminishing quantity of blood. Nevertheless, gradually increasing debility of the circulation, and of all functions dependent thereon, and consequent extreme emaciation, characterize this mode of death. Ultimately even the function of absorp-

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* See BURN's Principles of Midwifery, p 243. ARMSTRONG on Typhus, &c. p. 548. PARRY on the Arterial Pulse, Exp. 27. MARSHALL HALL on the Effects of Loss of Blood, p. 28. TRAVERS on Constitutional Irritation, p. 501.

† See BLUNDELL, Researches, &c.

tion is nearly suspended.   The appearances after death for-
merly noticed *, observed in a body free from other marks
of disease, are nearly characteristic of this cause of death.

The duration of life in such cases is very various, as
might naturally be expected, when it is remembered, 1.
That a degree of febrile action is excited, the intensity of
which will necessarily be very different in different consti-
tutions ; and, 2. That different living bodies are habitually
dependent in very different degrees on the alternate vital
actions of nutrition and absorption : Accordingly, in gene-
ral, fasting is best borne by those in whom these vital ac-
tions have been long languid; and in some such cases it
has certainly been borne for a period many times as long
as that which has been fatal in others.

VIII. After what was formerly stated, it is unnecessary to
enlarge on the phenomena of death by asphyxia, or begin-
ning at the lungs, whether by strangulation, suffocation,
drowning, confinement in a gas that is not poisonous, but
contains no oxygen, exposure of the surface of the lungs to
the atmosphere, pressure on their surface, occlusion of their
cells, or any other mode of obstructing the access of air to
the blood of the pulmonary artery, while the other organs
essential to life are uninjured.   In all these cases there is
a hurried and laborious action of the muscles of respira-
tion, and more or less of lividity ; then insensibility with
spasms, believed to depend on the contact of venous blood,
which has passed unchanged through the lungs, with the
brain and nerves; the respiratory efforts become irregu-
lar and then cease ; and on examination immediately after
this, the heart is found still contractile, but its left side
nearly empty, and the blood accumulated on its right side
and in the lungs; implying, that although some blood is
transmitted unchanged to the left side of the heart, and
thence sent over the body, yet it makes its way slowly and
imperfectly through the capillaries of the lungs, and at
length stagnates there, when it is not arterialized.

* Physiology, p. 178.

This accumulation on the right side of the heart is especially observed, when death is produced most slowly in this way, because then there is time for much of the blood from the body at large to reach the heart, before the final stop to its passage through the lungs.

It is important to remember the occurrence of insensibility, and often of spasms, before the circulation comes to a stand, or is even very much weakened, as illustrating what happens in many diseases affecting the functions of the lungs.

It is important to remember also, that the circulation comes to a stand before the heart has lost its power, as this is the foundation for the practice by which resuscitation from apparent death of this kind has often been accomplished, even some minutes after pulsation has ceased. Of that practice, notwithstanding some difficulties that have been started on the subject, it may still be maintained that the artificial respiration is the most essential part.

It may easily be believed, from what has been stated, that after such resuscitation, distress, and even danger, may result from the congested state of the lungs, and therefore that bloodletting may be useful in such cases, even before the circulation and animal heat are effectually restored in the extremities.

The tendency to a fatal termination in different diseases, and in different stages or circumstances of the same, is very different, and often complex; but is always susceptible of illustration by reference to the simpler cases of violent death now considered. And it is of especial importance to keep in mind these different modes of fatal termination in those diseases (such as fever) which admit of the greatest variety, in which different dangers threaten on different occasions, and in which various kinds of treatment are recommended; because it is only by anticipating the kind of fatal termination which is most probable in each case, that we can expect to be guided to a rational and scientific selection of remedies.

CHAPTER III.

OF THE REMOTE CAUSES OF DISEASE IN GENERAL.

THE living body assumes, in many cases, different kinds of diseased action,—varying remarkably in different periods of life,—without any apparent or known cause; but in the greater number of cases, certain circumstances in the situation or condition of patients, before diseases appear, can be assigned with confidence as their causes. The efficacy of these, however, is seldom established in any other way than simply by the observation, that persons known to be exposed to their influence, become afflicted with certain diseases in a proportion very much greater than those who are not known to be so exposed.

This kind of evidence is in many cases very liable to fallacy, in consequence of the great variety of the circumstances, capable of affecting health, in which individuals are placed, and of the difficulty of varying these, so as to obtain such observations, in the way of induction, or exclusion, as shall be decisive as to the efficacy of each. Hence the importance of the observations, intended to illustrate this matter, being as extensively multiplied as possible; and hence also the peculiar value, with a view to the investigation of the causes of diseases, of observations made on large and organized bodies of men, as in the experience of military and naval practitioners. All the circumstances of the whole number of men, whose diseases are there observed, are in many respects exactly alike; they are accurately known to the observer, and are indeed often to a certain degree at his disposal; they are often suddenly changed, and when changed as to one portion of the individuals under observation, they are often unchanged as to another; and therefore, the conditions necessary to obtaining an

experimentum crucis as to the efficacy of an alleged cause of disease, are more frequently in the power of such an observer, than of one who is conversant only with civil life.

But when the necessary precautions, as to the multiplication of facts, and the exclusion of circumstances foreign to the desired result, are observed, the efficacy of the remote causes of disease may often be determined with absolute certainty; and the knowledge thus acquired, as leading directly to the prevention of disease, is often of the greatest importance, especially with a view to regulations of Medical Police. And if the human race be destined, in future ages, to possess greater wisdom and happiness in this state of existence than at present, the value of this knowledge may be expected to increase in the progress of time; because there are many diseases which the experience of all ages has shown to be nearly beyond the power of medicine, but the causes of which are known, and under certain circumstances may be avoided; and the conditions necessary for avoiding them are in a great measure in the power of communities, though beyond the power of many of the individuals composing these.

Under the head of Remote Causes of Disease, we include not only causes acting externally to the body, but also circumstances in the condition of the body itself, previous to the attack of disease in question, which are believed to assist in exciting it; and of the mode of operation of these last, we have often more satisfactory information than of external causes. Some general observations on this subject will put it in a clearer point of view, than more detached and incidental statements in delivering the history of diseases would do, and will save repetition in future.

The Remote causes of disease are commonly divided into Predisponent and Exciting, the former of which have been long in operation before the disease appears, the latter immediately precede its appearance; it is impossible to distinguish them accurately in all cases; but nevertheless, this distinction, and especially the very frequent concur-

rence of causes of both kinds in producing disease, must be carefully kept in mind.

In illustration of this, it may be stated, that the heredi-tary nature of certain diseases (*i. e.* the peculiar tendency to them given by hereditary descent) is well ascertained; but some occasional external cause very generally excites the disease, to which there is this predisposition ; and those who attend only to the obvious operation of the exciting cause, are apt in this and other instances to overlook the evidence by which the efficacy of the predisponent is esta-blished.

Again, unless we attend to the very frequent concurrence of different causes in producing disease, we may readily misapprehend the evidence of the efficacy of a powerful exciting cause, as cold, contagion, or malaria, if we shall see it repeatedly applied to persons not predisposed to suf-fer from its effects, and taking effect only on those in whom its operation is aided by some latent predisposition, or some concurrent and accessary cause. Both these errors have very often occurred in medical inquiries as to the remote causes of disease.

I. The following may be stated as the chief predisponent causes of disease, that is, the circumstances to which we can in general refer the tendency observed in certain individuals, more than in others, to fall into disease on the application of the exciting causes, to be afterwards enumerated.

1. The transmission of the tendency to certain diseases from parents to children, has been already remarked as part of the general fact of the influence of the constitutional pecu-liarities of parents on their offspring *. But it is only to certain kinds of diseased action that this *predisposition from hereditary constitution* has been observed ; these are, cer-tain well-marked varieties of inflammation, termed the Scrofulous and the Gouty,—certain kinds of morbid forma-tions, especially the scrofulous tubercles,—and certain forms

* Physiology, p. 307.

of diseases of the Nervous System, Asthma, Epilepsy, and
Mania. Of these, the scrofulous affections only are in a
few instances *congenital*, as well as hereditary; and the ap-
pearance of the others is frequently determined more by
the application, and often the concurrence, of other causes,
than by the circumstance of hereditary predisposition in
those who possess it.

2. There are many causes very often observed to pre-
dispose to disease, which may be ranked together, as their
obvious effect on the system is very much alike. They
tend, whether acting singly or several in conjunction, to
enfeeble the vascular action in the body, and perhaps especial-
ly that in the extreme capillaries; and at the same time,
they *render the nervous system more susceptible* of impressions
from without. They thus dispose the body to suffer, and
especially the vascular action to become disordered, from
the application of exciting causes, either of acute or chronic
disease, which might be otherwise innoxious. But it does
not appear that any of these predisposing causes of them-
selves determine either the kind or the seat of the diseased
action which is to ensue:—they are often observed to pre-
cede, and believed to assist in producing, very different
kinds of diseased action, which may be seated in different
textures or organs, according to the original or acquired
peculiarities of individual constitutions.

Of this kind are,

(*a.*) Imperfect nourishment.

(*b.*) Deficiency of the natural stimuli of pure air, and of
muscular exercise.

(*c.*) Excessive exertion, mental or bodily, and deficiency
of the natural relaxation of sleep.

(*d.*) Long-continued heat, with little of the refreshing and
invigorating influence of occasional reduction of tempera-
ture.

(*e.*) Long-continued cold, not sufficiently counteracted by
artificial warmth, and by muscular exertion.

(*f.*) Intemperance, *i. e.* the frequent use of strong liquors,
in such quantity, that their first or exciting effect on vital

action, is more than counterbalanced by their more permanent depressing effect.

(*g.*) Excessive and repeated evacuations, either of blood, or of the serous part of the blood.

(*h.*) Depressing passions of mind, especially those which are of the longest continuance.

(*i.*) Previous debilitating disease, whether acute or chronic.

Ample experience, not only of what occurs within the observation of individuals, but more especially that which is afforded by statistical returns of the amount of disease and mortality in great towns, and chiefly in the worst aired parts of towns, as compared with agricultural districts;—in seasons of scarcity as compared with seasons of plenty;—among the most indigent classes of society, as compared with those in comfortable circumstances;—among the poorest inhabitants of hot or very cold climates, in circumstances where persons who have been more habitually protected from the extremes of temperature retain their health;—among the intemperate as compared with the sober;—in beaten armies, or among depressed and disheartened indi-viduals, as compared with victorious armies, or more fortunate and flourishing members of society,—establishes beyond all doubt the efficacy of these various debilitating causes in augmenting the amount and fatality of disease.

Some of the causes above enumerated peculiarly affect particular organs,—as heat the liver, and mucous membrane of the bowels, excessive mental exertion the brain, violent mental emotion the heart, &c.—and dispose them perhaps more than other parts to suffer from the application of exciting causes of disease. Others of the causes in question have a peculiar tendency to produce certain kinds of inflammation, as the air of low, damp, and crowded habitations, to determine the scrofulous form of inflammation.

But there is no one organ or texture which is uniformly affected, nor any one kind of diseased action which is uniformly excited, by any of these causes. Their general effect is, to dispose the body to suffer from the application of

the exciting causes of inflammation, or of other acute dis-
eases; and farther, especially when they are long applied,
to dispose the body to those kinds of chronic disease which
consist essentially in the deposition from the bloodvessels, in
different parts of the system, of morbid matters, which bear
more or less resemblance to the products of inflammation.

3. Again, there are certain diseases to which a tendency
seems evidently to be given by a state of general Plethora,
depending on full living and deficiency of regular exercise.
This is perhaps more strictly true of Gout than of any other
inflammatory disease, and of Apoplexy, than of any other
disease unconnected with inflammation.   There are others
which, if not necessarily connected with general plethora,
are evidently in a great measure dependent on partial
plethora, *i. e.* increased flow of blood to, or retarded re-
turn from, individual parts of the body; either occurring
before they first shew themselves, or manifestly facilita-
ting their recurrence.   Thus all secreting parts, at a time
when their secretions are peculiarly abundant, are un-
usually apt to have disease excited in them.   Indeed it is
by producing a state of partial plethora that several causes
already mentioned, and others to be mentioned imme-
diately, as predisposing to diseases of individual organs,
seem evidently to produce that effect.

A state of partial plethora, although it may be combined
with a weak state of vascular action over the body, can
seldom be effectually obviated without such evacuations and
low diet as may reduce and keep down the whole quantity
of blood in the system.

Those whose knowledge of diseases is chiefly taken from
examinations after death, as they generally find sufficient
lesions of individual organs to explain the symptoms and
event, see little of the evidence which establishes the im-
portance of general and local plethora as a cause of disease ;
but those who are accustomed to trace the whole progress
of individual cases, and observe the effects of remedies and
regimen on them, have ample grounds for the belief that
plethora, general and partial, is one of the most frequent,

and often the most remediable, of the causes to which attacks, and still more frequently recurrences, of various local diseases, whether inflammatory, hæmorrhagic, or more chronic, may be traced.

4. A frequent predisposing cause of local disease, which may be said to act by causing or facilitating partial plethora, is Previous Disease, and especially previous inflammation of the same organ, even although it may have been at some distance of time, and may have left no organic lesion. There is a similar tendency in diseases primarily seated in the nervous system, to facilitate their own recurrence. This is one of the circumstances by which the seat of the diseased action, that may be caused by any accidental excitement, is most frequently determined.

5. Organic disease already existing in the body, although in an inert state, and causing little uneasiness, very often acts as an important predisposing cause of other diseases, which might otherwise have been avoided; and that in three distinct ways.

First, The existence of organic disease, probably by reason of the quantity of blood directed upon it, and the consequent deficiency of the supply of blood to other parts of the body, appears frequently to dispose the whole system, in like manner as other debilitating causes, to suffer from the application of cold, contagion, or other causes of acute disease, more readily than it otherwise might have done. It is probably on the same principle that pregnancy and lactation render the body peculiarly liable to the acute diseases resulting from such causes. But it does not appear that this is true of all organic diseases; and especially those which are attended with a continual febrile or excited state of the circulation (*i. e.* Phthisis), appear rather to fortify the body against the attacks, at least of contagious diseases, than to predispose to them.

Secondly, Organic diseases already existing in the body, by confining the circulation in the parts that are still healthy, and often by obstructing the circulation, first in their own neighbourhood, and afterwards in more distant

parts, naturally and materially favour local congestions of blood; thereby disordering the functions of parts not themselves organically diseased, and frequently leading either to inflammations, serous effusions, or fresh solid deposits from the blood, according to the texture and vital properties of the organs where this local plethora is established; in the production or renewal of all which affections, however, external exciting causes may very often be observed to operate.

Thirdly, Certain kinds of organic disease (such, *e. g.* as scrofulous tubercles), already existing in the body, give a peculiar tendency to the reproduction of the same kind of morbid texture in any part of the body, where disease may be excited; the cause of which tendency will be afterwards discussed.

II. It is especially on those who are predisposed to disease, either generally or more partially, in some of the ways now mentioned, that the different Exciting Causes of disease act with full effect.

There are many cases, however, in which diseases are gradually formed in the human body, under the influence of the predisposing causes above stated, without any exciting cause being observed to operate. And there is hardly any exciting cause of disease that acts with uniformity or absolute certainty, even on constitutions apparently predisposed.

There is obviously an essential distinction between those exciting causes of disease which consist in the application, under peculiar circumstances, to the human body, of agents to which it is often and necessarily exposed, in all parts of the world, and those which result from the application of peculiar poisons, of local and temporary existence only. And it is of the more importance to attend to this, because there is an equally important distinction as to the kinds of diseased action which are found to be excited in the body by causes of these different kinds.

1. The following are the chief agents referable to the *first*

of these heads, which are found to act as exciting causes of disease.

a. Mechanical Injury, or chemical irritation, which, in a certain degree of intensity, infallibly excite inflammation, and when acting in co-operation with some of the predisposing causes above stated, excite either inflammation of a peculiar character, such as the gouty or the scrofulous; or else, if their application be long continued, some kind of chronic organic disease.

b. Muscular Exertion, hurrying the movement of the blood, and often more particularly disordering it, by reason of such efforts of straining, affecting the respiratory motions, as impede the return of the venous blood, especially from the head, and so favour local plethora.

c. Mental Emotion, or acute Sensation, sometimes suddenly affecting the actions of the heart, sometimes augmenting the flow of blood to the head, and sometimes more gradually modifying secretions, especially those of the alimentary canal.

d. Such Excess, or intemperance in eating or drinking, as may either injure the secretions of the stomach and bowels, or so stimulate the circulation, as to determine local congestions of blood in any part that may be predisposed to that state.

e. The sudden Suppression of accustomed evacuations, tending to a state of plethora, which will especially affect any organ that may be predisposed.

f. Such an amount of Evacuation from the body, as may suddenly depress the heart's action, or materially influence the functions of the Nervous System.

g. External Heat, in such a degree, as either to irritate the part to which it is directly applied, or to impress the nervous system violently, or to stimulate the general circulation and favour local congestions.

h. External Cold, applied in such circumstances as powerfully to affect the Nervous System, or to disorder the circulation.

In regard to this last, which is the most frequent and

powerful of this kind of exciting causes, it is to be observed, that Cold seldom acts as more than a predisposing cause of disease on the *external parts* directly exposed to it; any diseased action which these parts assume being in general directly excited by the subsequent restoration of temperature. It is in *internal parts*, the temperature of which is probably hardly affected, that cold is most apt directly to excite disease.

The Sensation of cold which is excited appears, according to principles formerly laid down, to be the connecting link between the cause applied externally, and the morbid action excited in the interior of the body; and the more acute, and more lasting, that this sensation is, the more powerful will be the effects resulting from it.

To this simple principle we can refer many facts, which are important to be known, as to the agency of Cold in exciting disease.

It has been already observed, that the degree of effect produced on Sensation, or on other vital actions, in the healthy state, either by heat or cold, is obviously proportioned, not so much to the actual temperature that is applied, as to the amount and rapidity of change of temperature, effected by its application; and the same holds of the morbific effects of these agents. Thus the natural temperature of the body, applied suddenly to a part previously long chilled by frost, produces just the same local effects, as the temperature of 212°, on a part not previously cooled.

In like manner, the effect of cold in producing internal disease is increased by previously heating the body, and still more remarkably by all the other circumstances stated above (p. 351) as weakening the circulation; because, when the body is under the influence of these causes, the lost heat is slowly and imperfectly restored, and the sensation heightened and prolonged. It is greater, for the same reason, when the cold is applied by a draft or current of air, or by wet clothes, which rapidly carry off the heat of the body; and it is greater when the cold is applied to the extremities, as the parts where the circulation is most languid.

It is probably owing chiefly to a languid state of the circulation during Sleep, and consequent deficient power of generating heat on the surface of the body, increasing and prolonging the sensation of cold applied at that time, that the system is then peculiarly apt to suffer from the application of cold.

On the other hand, the injurious effect of cold is lessened or prevented by such a vigorous state of the circulation as counteracts its effect on the temperature of the surface, or quickly restores the temperature that is lost,—therefore, by exercise, taken after the cold is applied, and by febrile excitement of the circulation, at least by such febrile heat as is attended with full strong pulse and dry skin; it is lessened remarkably by such intense occupation of mind, as limits the intensity and duration of the sensation resulting from it; and it is lessened by such habitual exposure to variations of temperature, as blunts somewhat the sensibility of the surface, and excites and strengthens the capillary circulation there, according to principles that have been already explained.

2. Of those exciting causes of disease, which act, often with extreme virulence, and on great numbers of the human race, but only at certain times and at certain places, we may first notice those which are ascertained to consist in the introduction, by the *primæ viæ*, of substances acting as poisons on the system, although so slowly, that their effects are usually ranked among diseases, not as examples of poisoning.

Thus, the symptoms of Scurvy, depending in a peculiar alteration of the blood, are ascertained to proceed from the long-continued use of innutritious, and especially of salted aliments; a peculiar form of external inflammation, tending rapidly to Gangrene, has been distinctly traced to the use of wheat or rye infected with the parasitical plant called the Ergot; a peculiar variety of Colic, and such an alteration of the nutrition of muscles as produces a certain form of Palsy, are the well known effects of the poison of lead

slowly introduced into the body; certain varieties of in-
flammation of the skin are produced by some vegetables,
and by some species of fish, acting as poisons; and it has
lately been ascertained, that peculiar affections, which have
been endemic in some parts of Germany, depend on some of
the ingredients used in making cheese and sausages, which
are there common articles of diet.

It is important to observe, that in all these cases, the
efficacy of the alleged exciting causes is ascertained, not by
the affection of all who are exposed to them (for none of
them act with unerring certainty), but by the affection of a
certain number only of those persons, and by the immunity
of all who are certainly known to avoid them.

There are more topical diseases known to be *endemic* in
certain localities (*i. e.* to prevail pretty uniformly and ex-
clusively in these), which are also generally believed to de-
pend on certain substances taken into the body, and ope-
rating injuriously on certain organs or textures, although
their nature, and the mode of their introduction, have not
yet been clearly detected, *e. g.* the Bronchocele, in some
hilly countries, or on the banks of certain rivers, the
Cretinism of the Alps, the Guinea-worm of some parts of
Africa and India, the Elephantiasis of Egypt, the Pellagra
of Lombardy, &c.

Again, there are other diseases of much greater import-
ance, because, at certain times, much more generally and
fatally prevalent, which we ascribe with equal confidence to
the operation of certain specific poisons; although these are
imperceptible to our senses, and known to us only by their
effects on the human body; and although the mode of their
introduction into the body (by the absorbent surface of the
lungs) is only matter of presumption, not of actual obser-
vation.

These are the diseases which prevail *epidemically*, *i. e.*
in certain districts or countries, and at certain times only,
while other countries, and the same at other times, are
quite free from them.

The mere fact of a disease (clearly distinguished from

all others) being absolutely unknown for a length of time, in any large community, and prevailing extensively in another in a similar climate, or in the same community at another time, is enough to show that it has a local and temporary cause; and that all reference of its origin to such exciting causes only as were treated under the last head (and which must inevitably be applied to many persons in a very large community, even within a limited period of time), must be totally unavailing.

Such a disease may always be suspected to proceed from a Poison somehow introduced into the body, and experience teaches us, that the origin of that poison is generally to be looked for, either in certain effluvia arising from the earth, or in exhalations from the bodies of persons previously affected with the same diseases, *i. e.* that these diseases usually arise either from a *Malaria* or a *Contagion.*

At the same time, it must be allowed, that there are diseases which occasionally prevail much more extensively than usual, and take nearly the form of epidemics, but do not appear, from the mode of their extension, either to be confined to limited districts, or to be propagated solely or chiefly by contagion. Of this we have examples, in certain seasons, in Erysipelas and in Dysentery, and according to the opinion of many, in epidemic Cholera. It appears well ascertained that all these shew a certain degree of contagious property, but their extension does not appear to be exclusively owing to this property. It is commonly referred to the rather vague principle of peculiar constitutions of the atmosphere; but it is doubtful whether this term be correctly applied.

The following are the facts observed as to the extension of an epidemic disease, which lead us to believe that it arises from a Malaria, or emanation from certain portions of the earth's surface.

1. Such a disease is found to prevail within certain limits only, all persons who avoid these localities escaping the disease, although in all other respects similarly circumstanced to those who become affected.

2. The districts infected with such a disease are, in some

respeets at least, similar to one another, in the different parts of the world where they are found.

3. No preeautions for the separation of the siek from the healthy, within these distriets, appear to have any effeet in limiting the extension of the disease; but the removal of the inhabitants, both sick and healthy, to other distriets, appears obviously to arrest, in a great measure, the extension of the disease among them; and is unattended with any injury to the health of those with whom they are associated after their removal.

It is by faets of this kind that we are assured, that some kind of subtile matter arising from certain parts of the earth's surface, especially from parts of it on whieh water has stagnated, and from whieh it has gradually evaporated, is the eause of Intermitting and Remitting Fevers; which vary remarkably in different seasons and climates, and at different elevations above the level of the sea, but still retain the same general eharacters.

Whether the putrefaetion of animal and vegetable matter is a eondition essential to the generation of this Malaria, is mueh more doubtful; but it is certain that the conditions whieh are essential, belong to the loealities whieh are thus affeeted, not to their inhabitants; and it will afterwards appear that the laws of its development and diffusion are to a certain degree aseertained.

Again, the following faets, when earefully observed, as to the mode of extension of other epidemie diseases, espeeially if observed about the time of their eommeneement, when they are not yet generally diffused, leave no room for doubt, that they propagate themselves by Contagion, or in eonsequenee of exhalations or seeretions from the bodies of persons already affected with them, being somehow introdueed into the bodies of those who beeome affeeted in their turn.

1. Sueeessions of eases, of the diseases in question, are observed within narrow limits, both of spaee and time; first in one situation, and afterwards in others; while other distriets, similarly eireumstanced, and fully inhabited, are wholly unaffeeted.

2. On inquiring into the circumstances of these successions of cases, we find them in various situations, not confined to one description of locality, and in situations which vary quite irregularly with the different returns of the disease, instead of remaining nearly fixed, as is the case in regard to malarious districts.

3. There is very frequently, in such cases, evidence of importation into the affected districts, *i. e.* the first patient in the succession is found to have had intercourse with persons who have had the same disease, or recently recovered from the same disease elsewhere;—either directly, or through the intervention of substances, to which exhalations from sick persons may easily attach themselves.

4. Within the district where the disease exists, those persons who have earliest and closest intercourse with the sick, are observed to be first and chiefly affected.

5. Absolute seclusion from all intercourse with the persons or houses affected, produces complete immunity to whole families, to the inmates of barracks, schools, workhouses or hospitals, even in the midst of the infected districts.

6. When the sick are carefully separated from the healthy in the beginning of the disease, and all substances, to which exhalations arriving from them can have attached themselves, are purified, the extension of the disease, even within the infected districts, is obviously diminished, or even entirely stopped.

Observations of these different classes are so many different ways of establishing the general propositions,—
1. That those who have intercourse with the sick, are affected with one of these diseases in a proportion very much greater than those who cannot be ascertained to have had such intercourse; and, 2. That no other common circumstance, but that of intercourse with the sick, can be ascertained to exist in the case of most of the persons who are affected, and not to exist in the case of the much greater number who escape. And when these propositions are established, especially in the case of a disease which has recently invaded a large community, and affected only a small por-

tion thereof, a calculation of chances puts beyond all doubt the efficacy of the circumstance of intercourse with the sick, in determining the attacks of the disease.

All other considerations are perfectly irrelevant as to the question of the contagious nature of a disease, but those which bear on the evidence of the propositions stated above. For example, the escape of great numbers of those who have intercourse with the sick, is no evidence of the disease not being contagious, if it be ascertained,—1. That the disease is one of local and temporary existence only ; and, 2. That of those known to have had intercourse with the sick, the proportion who take the disease is very much greater than that of those in whose cases such intercourse cannot be traced.

It is on evidence of this kind that we ascribe more or less of a contagious property to various febrile diseases,— the Continued Fever of this climate, and probably a continued fever occasionally prevailing in hot climates,—Small-pox, Chicken-pox, Measles, Scarlatina, Plague, Erysipelas, Dysentery, Influenza ; and the same evidence will be found to extend to the epidemic Cholera ; although there are certainly anomalies as to the propagation, as well as the symptoms, of that singular disease.

It is by similar evidence that we are assured of the contagious property of scabies, syphilis, gonorrhœa, and purulent ophthalmia. The accuracy of the conclusion is confirmed in the case of several of the febrile diseases, as well as of those chronic diseases, by the effect of inoculation. The very peculiar contagious poison by which hydrophobia is excited, has never been observed to be communicated otherwise than by inoculation.

But in ascribing a contagious property to a disease, we must be careful not to consider it as ascertained, that contagion is its only exciting cause. There is good reason to believe, that several of the diseases now mentioned originate occasionally, at the present day, from unknown causes, and perhaps extend themselves in an unknown way, besides being propagated by contagion.

Some special laws, that have been ascertained in regard to malaria and contagion, will be more properly stated as part of the history of the diseases which they excite; but it is important to state here some general facts in regard to the whole of this class of the exciting causes of disease.

1. The well-ascertained fact, that the morbific effect of these poisons is remarkably increased by debility and in-anition, and diminished by fulness and excitement, of the vascular system, gives good reason to believe that their action is consequent on their absorption into the blood; because it appeared formerly, that by these circumstances absorption is remarkably increased and diminished *.

2. None of them act with uniformity, epidemic fevers of all kinds, and all contagious diseases, varying extremely in character, in prevalence, and in malignity, at different times, and for reasons which are very imperfectly known.

This difference is evidently in part owing to the concurrence, or absence, of some of the predisposing causes of disease above stated, especially of impure air, imperfect nourishment, and mental depression, long-continued heat or cold; but there are many cases of such difference which we can ascribe only to variations in the nature and virulence of the morbific poisons themselves.

3. None of them act with unerring certainty; some persons escaping, even when such diseases are most prevalent and malignant, and in the circumstances in which the greatest number suffer.

4. Both malaria and contagion are very often aided in their effect, not only by predisposing causes, preparing the body for their reception, but by exciting causes, concurring with them, and determining attacks of disease, which might probably otherwise have been avoided. Thus during an epidemic fever, so many attacks immediately succeed exposure to cold, that many pathologists have thought this a sufficient exciting cause of that disease; and in the malarious countries, so many agues are contracted apparently by exposure to cold, or intemperance, that some have represented

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* See Physiology, p. 67.

the malaria as the predisponent, and cold or disordered stomach as the common exciting cause of ague. In like manner, scurvy, although the specific effect of salted aliments, is very generally observed to be essentially aided and promoted by cold, by intemperance, and by mental depression.

It is probably to the frequent concurrence of other exciting causes with malaria or contagion, in producing epidemic fevers, that we should ascribe the remarkable fact, that when such epidemics are most prevalent, most other diseases nearly disappear; the poison already imbibed into the human system, determining the excitation of its own peculiar effect, on the application of any one of the common exciting causes of disease, rather than of the other diseases, which at other times might result from that application.

It appears, therefore, that the agency of those causes of disease, which we call specific poisons, differs from the agency of what are more commonly called poisons, in being much more dependent on contingencies, subsequent to their introduction into the body; and this fact, which could not have been anticipated *a priori*, but seems well ascertained, enables us to understand that in certain cases, even after the diseases resulting from these agents have shewn themselves, they may be not only conducted to a favourable termination, but successfully *arrested* in their course.

5. In all the febrile diseases which are of local and temporary existence, and result from the operation of these poisons, there may be observed, at least when they appear in their violent form, a peculiarity of symptoms, and a kind of danger, hardly to be dreaded in diseases excited only by such causes as are of more general and permanent existence. This peculiarity may be said to consist in a general depression of vital action, and an alteration of the vital properties of the blood, and is denoted by the appearance of more or less of the symptoms, which have the name of *typhoid*.

CHAPTER IV.

OF DISORDERED ACTION OF THE HEART.

ARRANGING the subject of Pathology as nearly as possible in the same order as the Physiology, we examine first those diseased actions in which the organs of circulation are chiefly concerned. We do not affirm, that the affection of the circulation is the primary change in these diseased actions; but it is certainly the most obvious, and is that by which the application of remedies is chiefly guided. Of these, a few appear to consist essentially in alterations of the heart's action; the greater number manifestly originate in the capillary vessels; as may naturally be expected when it is remembered, that these are the scene of the continual vital changes which it is the object of the circulation to maintain.

Three morbid states of the action of the Heart may be frequently observed, and easily distinguished,—Deficient action, Inordinate or Irregular action, and Painful action.

I. The deficient action of the heart demands particular attention, both theoretically, as illustrating the important subject of the connexion between the nervous and vascular system in the living body, and also practically, not because it is frequently met with as the sole cause of danger, but because it takes place in a greater or less degree, and constitutes a part of the danger, in many complex diseases; and because we are necessarily very much guided in the use of remedies in these, by the degree in which the danger may or may not appear to consist in this part of the morbid changes.

The defective action of the heart, and threatening of Syncope, or of death beginning at the heart, is of course most essentially characterized by feebleness of pulse, by paleness and coldness of the surface, often attended with

cold sweating, and by muscular debility; but in many cases, more striking symptoms are presented by the change in the condition of the Nervous System which is connected with the enfeebled state of the heart; and there has been some misapprehension as to the characteristic symptoms of this state, from the great variety that exists as to the degree in which the Nervous System participates in the depressed state of the Vascular System.

The circumstance on which this variety appears mainly to depend is the degree of suddenness with which the depression of the heart's action is effected.

When it takes place *slowly*, the impetus of the blood on the brain and nerves being very gradually diminished, the Nervous System suffers in the first instance very little, and the pulse may become imperceptible, and the skin quite cold, before the senses are obscured, or the intellect sensibly impaired. The senses of sight and hearing are generally the first that are blunted in such cases; but the mind is clear,—voluntary motions, though enfeebled, may often be performed with precision,—and the sensation which prompts to acts of respiration is so entire, that a heaving and laborious breathing is gradually produced, evidently depending, not on any impediment to the access of air to the lungs, but simply on the increasing difficulty, with which the enfeebled heart propels the blood through the lungs. This is the state of the symptoms in many cases of disease, when there is imminent danger of death by syncope. In such cases, the pulsations of the heart become usually more frequent as they become feebler.

But when the heart's action is *rapidly* depressed, as by hæmorrhage, or violent mental emotion, the sudden diminution of the pressure on the brain and nerves, like other sudden changes in the condition of these parts, powerfully affects the functions of the Nervous System; and there is first vertigo, tinnitus aurium, confusion of thought, and then often an instantaneous loss of sense, intellect and voluntary power, constituting what is called a complete fit of syncope, even when the pulse is still quite

perceptible, and before the surface has become cold. In such cases the diminution of sensation is often such, that the action of respiration, as well as all perceptible action of the heart, may be nearly or entirely suspended for a time, without any bad consequence. A sensation of anxiety and of nausea, prompting to acts of vomiting, is a common accompaniment of the impression made on the Nervous System in such sudden syncope. The pulsations of the heart, in this state, especially if the patient has previously been of strong habit, are generally slow as well as feeble.

There are some cases, usually called cases of syncope, where the sudden loss of sense and voluntary power takes place almost without alteration of the heart's action, and which in their pathology are more closely allied to Epilepsy.

It has been already stated, that a sudden diminution of the pressure on the brain and nerves is itself a cause, not only of insensibility, but of weakened action of the heart; and the impression made on the heart's action, especially in a feeble and irritable habit, by bleeding in the erect posture, as compared with bleeding in the horizontal,—or by rapidly assuming the erect posture after stooping down,—is enough to establish this principle.

When, therefore, we see fits of syncope, or a tendency to it, brought on either by loss of blood, or by purging, or sweating, or by alteration in the distribution of the blood, as by drawing off the fluid of ascites, we may reasonably infer, that the immediate cause of the complete failure of the heart's action is not the mere diminution of the stimulus acting on the heart, but a change in the condition of the Nervous System; just as it certainly is, when syncope is produced by strong mental emotions, by certain long continued and unpleasant sensations, such as particular odours or by intense pain, or the sudden transition from pain to ease, which are likewise frequent exciting causes of this affection. The secondary action or reaction on the heart, of diminished pressure on the brain, (originally consequent in some cases on deficient action of

the heart itself) is very important to be kept in mind in all speculations as to Syncope; and explains the well known effect of the horizontal posture, not only on the nervous symptoms in syncope, but on the affection of the heart itself.

But all this does not establish, as CULLEN and others have conjectured, a necessary *dependence* of the heart's actions on the brain (a supposition which is inconsistent with facts formerly stated); it is only one of the considerations which prove, that in the living body the actions of the heart are subjected to an *influence and control*, from certain changes which take place in the nervous system; and which probably extend, as was formerly illustrated, over the whole of that system, and act at a peculiar advantage on the heart, as an organ connected through the ganglionic nerves, with all parts of the cerebro-spinal axis*.

The agency of all exciting causes of Syncope is greatly increased by certain circumstances of predisposition, sometimes by peculiarity of constitution of which no account can be given; but often by deficiency of the vital fluid, or general weakness of vascular action, as in convalescents from other diseases, or in persons exhausted by muscular exertion, or under the influence of sedative causes, as certain poisons or contagions; or else, by such a state of excitability or *mobility* of the body, that impressions from without peculiarly affect the nervous system, and again, that affections of the nervous system are transferred with peculiar facility to other living parts, and especially to the heart. It is thus that in women, especially of feeble and irritable habit,—about the menstrual period more than at other times,—in women affected with the slighter uterine diseases, and in persons labouring under long-continued mental depression or anxiety,—all the exciting causes of syncope act with peculiar effect.

II. There are several varieties of Inordinate Action of the

* See Physiology, p. 275.

heart, unconnected with organic disease, which it is to no
purpose to consider separately, because we know little of
the causes of their difference. Such are permanently in-
creased frequency, and sometimes apparent strength, of the
heart's pulsations, with perfect regularity, and nothing un-
usual in the mode of contraction; or occasional violent fits
of palpitation from exercise, mental emotion, or other slight
causes, (*i. e.* such causes as produce palpitation in the healthy
state, but in a much less degree, and of much shorter dura-
tion); or paroxysms of irregular action, the irregularity being
sometimes in the succession of the pulsations, and some-
times rather in the mode in which each contraction is ef-
fected. In all these cases there is more increase of the
sound, than of the impulse of the heart's action, experien-
ced by the ear laid on the chest; and the last of these, the
irregular contraction of the fibres, is denoted chiefly by un-
natural sounds attending the pulsations.

In regard to all these cases of morbidly irregular or ex-
cessive action of the heart, it is to be observed, that if un-
connected with increased bulk of its muscular substance,
they seldom or never indicate any real increase of strength.
But they are sometimes evidently dependent on fulness
of blood, and increased stimulation of the heart; and far-
ther it seems a general law, that when the heart is feebler
than usual, it becomes more irritable, its contractions are
more easily excited, and more easily deranged. Hence
both habitual frequency of pulse, and likewise fits of palpi-
tation, or irregularity of pulse, are often observed under
the same circumstances, or in the same persons, as the ten-
dency to syncope; and are, equally as that tendency, often
to be ascribed rather to alterations in the state of the ner-
vous system, than of the heart itself.

The unusual irritability of heart, indicated by the modi-
fications of its action above stated, is remarkably observed
in persons previously healthy and full-blooded, when taking
little exercise, when enjoying less sleep than usual, and
when under the influence of mental anxiety. It is often
observed also in persons previously healthy, but much

weakened, as during convalescence from acute diseases; and farther, in certain chronic diseases, particularly those which are attended with habitual uneasy sensations at the stomach. In cases of this last kind, inordinate pulsation is often observed almost exclusively along the abdominal aorta, the immediate cause of which is still uncertain.

Although advantage may often be derived, in the earlier stages of these cases of increased and irregular action of the heart, without change of structure, from loss of blood, as may naturally be expected when they occur in pretty full habits, yet it may be stated in general, that ultimate and permanent relief to them is obtained chiefly by remedies and regimen of the tonic kind, *i. e.* by which vascular action is invigorated, and the nervous system rendered less liable to sudden and injurious impressions.

III. Painful action of the heart is that affection which, in its extreme degree, is described under the name of Angina Pectoris, and is marked by acute pain, not only in the situation of the heart, but in general extending sympathetically * to the left shoulder, and down to the left arm, generally brought on, and always remarkably aggravated, by any such exertion as may quicken the heart's action. This pain occurs, however, in different cases with very various degrees of intensity; and is attended with various affections of the movement of the heart, generally with increased action at the time when it begins, but in severe cases, with greatly diminished action during its continuance, whence it has had the name of Syncope Anginosa. It obviously depends immediately on an impression made on the sensitive nerves of the heart; but what circumstances are essential to this impression is still uncertain. It is not necessarily connected with any kind of organic disease at the heart, but is seldom well marked when no such organic disease exists. It is certainly more immediately connected with fulness of blood than mere palpitations are, and is

* See Physiology, p. 208.

hardly ever permanently relieved otherwise than by evacua-
tions and low diet.

As both palpitations and painful action of the heart must
naturally be readily excited, when the tendency to them
exists, by any cause increasing the quantity of blood brought
to the heart by the veins in a given time, it is easy to un-
derstand, that at the moment of transition from the state of
waking to that of sleep, when the circulation on the surface
of the body is repressed *, these affections of the heart should
especially occur ; and also, that their occurrence at that
time should very frequently, though often only temporarily,
be relieved by loss of blood.

It is obvious, that both palpitation and irregular painful
action of the heart, will more easily be excited when there
is any obstruction to the free transmission of the blood
through the heart, than when the motion of the blood is
free ; and therefore, that habitually increased strength and
fulness of pulse, palpitations, irregular pulse, and fits of
angina pectoris, must be much more frequent and dange-
rous when any disease of the valves of the heart, or of the
aorta, impeding the transmission, or allowing the reflux of
blood, exists, than in any other cases.   And although it is
perhaps not so easy to explain the fact, it is equally cer-
tain, that in those circumstances fits of syncope are frequent
and dangerous.

The existence of such organic obstructions to the course
of the blood, is very generally demonstrated, soon after
they have commenced, and in many instances their nature
is more specifically indicated, *first*, By the enlargement of
the heart, and often of the aorta, consequent on them, and
which is easily ascertained after a time both by the ear and
the hand applied to the chest ; *secondly*, By the increased *im-
pulse* which the heart communicates to the parietes of the
chest, when, as commonly happens in consequence of such
obstructions, it has got into the state, not only of dilatation,
but of hypertrophy ; and *thirdly*, By alterations of the na-

* See Physiology, p. 280.

tural sounds, that attend the heart's actions,—consequent on the obstructions which the current of blood encounters, and especially on the modifications of the muscular contractions, which are required to overcome these obstructions.

The nature of the diseases which produce these obstructions, and the ulterior consequences to be apprehended from them, besides the mere disorder of the action of the heart, will come under consideration afterwards.

CHAPTER V.

OF LOCAL DETERMINATIONS AND CONGESTIONS OF BLOOD, AND THEIR IMMEDIATE EFFECTS.

OF diseased states of the body, originating or chiefly existing in the organs of circulation, the next in point of simplicity to the affections of the heart itself, are the occasional determinations or congestions of blood, affecting individual organs or textures, which are known frequently to occur, and the effects of which are very various. They often lead to, or are combined with, not only great increase of exhalations, or of secretions, but likewise with increase of the nutrition of healthy textures, or with such perversions of nutrition, as constitute morbid or adventitious structures; and we shall find that they often pass into true inflammation, acute or chronic; but without altering the chemical phenomena, or the products from the blood in any part of the body,—they may be injurious, or even dangerous in two ways, *first*, By disturbance of the functions of the parts where they take place, independently of any lesion of their structure; and, *secondly*, By leading to extravasations of blood, and either to hæmorrhages, or to such lesions of the structure, and consequent derangement of the functions of parts, as result from the simple effusion of blood into them.

The study of these disorders of the circulation, and of their causes, is therefore important, both with a view to

their immediate effects, and also to the pathology of the most important acute and chronic diseases, to be afterwards considered.

There is probably no kind of diseased action of which any part of the living body is susceptible, which is not connected sooner or later with increased afflux of blood towards that part, either as its cause or its effect, and the immediate object of all our most powerful remedies is to act on these irregularities of the circulation; but it is important to distinguish accurately in the first instance, the causes that may be assigned for, and the effects which may be ascribed to, mere increased flow of blood to a part, independently of any *alteration* in the vital actions that go on there.

That the quantity of blood circulating in the small vessels of any part of the body may be occasionally and greatly increased, is obvious from what is known of the structure and distensibility of the vessels, and from what has been often observed of the capillary circulation in those parts of animals, where it can be best examined with the microscope. And the phenomena formerly mentioned, of temporarily increased sensations, of periodic nutrition of parts, and of the effects on the circulation, in various organs, of sensations and emotions of mind, clearly shew that in the perfectly natural and healthy state of the body, occasional and great congestions of blood are a part of the intentions of nature.

Much stress has been laid by some pathologists on the difference between *active* congestions of blood, brought about by evidently increased action of the heart, and at least probably increased action of arteries; and *passive* congestion, in which there is evidence of languor, and deficient rather than increased action in any part of the vascular system. But it is only in a few cases, that this distinction can be accurately observed. In by far the greater number of cases, there is evidence of what may be called active congestion in the first, and of passive congestion in the last stage, of the same affection.

It is farther known, that certain textures and organs of the body are much more liable to such congestions of blood than others, by reason of the quantity of blood which they receive in the healthy state, and especially, perhaps, of the variations to which that quantity is habitually liable. The mucous membranes, and the parenchymatous viscera, the lungs, liver, spleen, and kidneys, are frequent seats of morbid determinations or congestions of blood. And notwithstanding what was formerly said of the peculiarity of the circulation in the brain, and the impossibility of much variety ever taking place in the quantity of blood within the cranium; yet, as the impetus with which the blood enters the brain, the quantity passing through it in a given time, and even the quantity existing at any given time, in one part of it, as compared with another, are all liable to change, there is no sound theoretical objection to the belief, of occasional determinations and congestions of blood taking place there also; and the evidence of these actually and frequently occurring, and leading to some of the principal diseases of the brain, to be afterwards stated, is in many cases quite conclusive.

It is certain also, that there is a difference at the different periods of life, as to the parts in which congestions of blood and hæmorrhages are most apt to occur, and for this probable reasons have been assigned. In all parts of the body, as growth ceases, the capillary circulation becomes more confined than before, and a morbid fulness of the vessels is more easily produced. About the period of puberty,—the head having acquired its full size more nearly than other parts, and the blood sent thither having a less capacious capillary system to receive it, than in parts still growing,—on occasion of any unusual fulness of blood, or hurry of the circulation, a morbid fulness is apt to take place in the head, and hæmorrhage from the nose is common. When the growth of the whole body is over, it may be supposed that the blood, diverging less than before, and not detained so long in the capillaries of the greater circulation, will return quicker to the heart, and congestion and

hæmorrhage in the lungs be more easily produced than pre-
viously.   In women, during the continuance of the pe-
riodical menstrual discharge, the uterus may be expected
to be more liable to morbid congestion of blood than other
parts.   And in all persons in the decline of life, when the
vessels lose somewhat of their propelling power, and the
capillary circulation is much limited, venous plethora may
be supposed to become more common, and, according to
circumstances to be afterwards mentioned, may be produ-
ced especially, either in the vessels of the head, or in those
of the abdomen, disposing most generally to apoplectic
attacks in the former case, and to hæmorrhoids in the lat-
ter.   Several of the general causes of disease, already men-
tioned, may be said to act chiefly by promoting or exciting
such irregularities in the distribution of the blood as we
now consider, whether these are their sole effects, or whe-
ther, through the medium of these, they lead unto other
and more permanent consequences.

In a large proportion of cases, even of congestion that does
not go on to inflammation, it appears distinctly, that the
cause of the affection is some local irritating cause, by
which the vital actions of the part are first altered and in-
creased, and on the local effect of which, the determina-
tion of blood to the part subsequently supervenes; just as
it was formerly stated, that in the healthy state the flow of
blood to any part of the system is very much determined
by causes acting on the extremities of the arteries there,
and the effect of which is more properly expressed by the
term *Attraction*, than either by Propulsion or Retardation,
of the circulating fluids.

Thus when excessive mental exertion or emotion affects
the brain, when mercury affects the salivary glands, heat the
liver, irritating vapours the bronchiæ, or various ingesta
the stomach or bowels, so as morbidly to excite the actions
which take place in the capillaries of these parts, without
causing inflammation, a determination of blood to them is
effected by an influence which is *retrograde along their ar-
teries*.

But the effect of these local irritations will naturally be very much increased by the action of causes which operate more generally on the circulation, and on the distribution of the blood; and in many cases it is obvious, that causes of this kind are adequate of themselves to the production of local congestion. The following are the chief causes, independent of local irritation of any particular set of capillary vessels, by which irregular determinations of blood appear evidently to be promoted or excited.

1. It is obvious that the tendency to any morbid congestions of blood will in general be greatest when the whole quantity of blood in the body is excessive, and, therefore, that full living, and indolent or sedentary habits, which, in a healthy constitution, naturally favour Plethora (and therefore promote the formation of the fat, which seems to serve as a depository for superfluous nourishment in the animal body), will often predispose to this class of diseases.

Persons in the prime of life, who are vigorous and plethoric, are certainly less liable to *inflammatory* diseases than others are, these diseases usually beginning with a state of depression and debility in the circulation on the surface of the body, which is not easily produced in such persons. But they have no such immunity from simple *congestions* of blood; and those especially in whom (as appears often to be the case) the state of plethora is attended with a feeble rather than vigorous condition of the moving powers of the circulation, are naturally predisposed to congestions and hæmorrhages.

2. It is also reasonable to expect, that the Suppression of accustomed Evacuations, by increasing the state of plethora, sometimes probably by the irritation consequent on the retention within the body of matters destined to excretion, may have a peculiar tendency to produce such disorders of the circulation. It is in this way, accordingly, that this cause of disease appears manifestly to operate; and there are many cases, *e. g.* of Apoplexy or Epilepsy, consequent on suppression of the discharge from hæmorrhoids, or of Hæmorrhage from the nose, lungs, or stomach, consequent on

suppression of the menses, where very serious consequences result from the local congestion of blood, although unattended with any other diseased action.

3. The tendency to local congestions of blood is very much dependent, in many cases, on previous diseases, especially on such previous Organic Lesions, even of distant parts, as obstruct some portion of the circulation; whence it happens that these local congestions are not only the cause of many diseases, but often the consequence, and the most dangerous part of the effect, of others. Of this the following are the most remarkable examples.

a. The congestion of blood in the Lungs,—leading to various alterations of these, and frequently to effusion of blood into the air-cells, with or without hæmoptysis,—very often consequent on such disease of the heart or aorta as obstructs the flow of blood through the left side of the heart.

b. The stagnation of blood in the vena cava descendens, and appearance of various symptoms indicating compression of the Brain, or sometimes bloody effusion on the brain, consequent on obstruction to the flow of blood through the heart, and therefore frequently succeeding to violent palpitations, however caused.

c. A similar stagnation in the jugular veins and congestion in the head, leading to various diseases of the Brain, in cases of disease where there is obstruction to the free flow of blood through the lungs, although the heart be sound, especially if there be frequent exertions of coughing (implying an additional cause of disturbance of the circulation, to be considered immediately), as in Bronchitis, Hooping-cough, or Asthma.

d. A congestion of blood in, and consequent enlargement of, the Liver and Spleen, and congestion in, and sometimes hæmorrhage from, the Stomach and Intestines (especially their mucous membrane), very often consequent on such disease, either of the heart or lungs, as habitually retards the flow of venous blood on the right side of the heart, and occasions stagnation in the vena cava ascendens;

—the nature of which is well illustrated by the condition of those parts in persons suffocated or strangled.

  e. A congestion of blood in the Stomach and Intestines, especially in their mucous membrane, and frequently hæmorrhage from that membrane, producing Hæmatemesis, or Melæna, or both, consequent on any such organic disease of the liver as obstructs the flow of blood through the vena portæ.

  It is easy to understand that such obstructions to the circulation as thus favour congestions and hæmorrhages, should also very frequently lead to increased serous effusion from the parts where that exhalation is always going on; and that a slight change of circumstances may often determine whether such effusion from the serous membrane, or hæmorrhage from the mucous membrane in the thorax or abdomen, should result from obstruction at the Heart or at the Liver.

  It will appear afterwards, that very many cases, both of acute inflammation, and of chronic lesions of texture, in the organs now mentioned, are referable in part to the obstructed state of the circulation and consequent congestion of blood now in question.

  Even independently of such manifest obstructions to the course of blood in the larger vessels, as result from the kind of organic disease now mentioned, it is obvious, that any tumour or adventitious structure existing in an organ, must obstruct and disorder more or less the circulation through the healthy parts of that organ, and may therefore give occasion to congestion, and to hæmorrhage or other consequences of congestion there, as is occasionally seen in the course of chronic diseases in the lungs, and more frequently in the brain.

  4. It is known, by ample experience, that the tendency to any local determination or congestion of blood is very much increased by its having once occurred, so that all diseases dependent on this cause may be said to facilitate their own recurrence; although our knowledge of the causes of the movement of the blood in the capillaries does not en-

able us to say with confidence, what is the nature of that vital action which appears thus to be strengthened by re-peated exertion. In consequence of this increase of the tendency to them from repetition, diseases which proceed from this cause become gradually less and less dependent on general plethora, or on excitement of the circulation, for their reproduction; and hence, when they have become habitual, the remedies which were useful in their com-mencement become quite inefficient.

5. There is in some persons at times a peculiar State of the Blood, by which the tendency to hæmorrhage, and perhaps to congestions of blood preceding hæmorrhage, is greatly facilitated, viz. the state in which it is preter-naturally fluid, and its coagulation imperfect, as in Scurvy, and in Purpura from unknown causes.

6. There is in many persons, especially in those somewhat advanced in life, a condition of the Bloodvessels, which greatly facilitates their rupture; viz. a rigid, inelastic, and brittle state of their coats (consequent on local disease of them to be afterwards considered), and often a partial thin-ning or even ulceration of these. Where such disease exists, especially within the cranium, the action of any of the ge-neral causes of congestion of blood is of course peculiarly dangerous.

7. Many of the more strictly Exciting Causes of disease, formerly enumerated, have a peculiar effect in determining local congestions of blood, and their immediate conse-quences, especially the following.

a. External Heat acting as a general stimulus to the circu-lation, and " urging to excess inequalities in the distribu-tion of the blood, otherwise innocent," as is often seen in the effect of this agent on determinations of blood to the brain, and their consequences, and still more remarkably in its effect on the abdominal viscera, which it disposes to diseases that necessarily imply a great increase in the quan-tity of their blood.

b. External Cold, partially obstructing the flow of blood through certain parts of the body, and proportionally

augmenting the flow through others; on which account, the very same diseases of the brain have often been found to result from incautious exposure to cold as from intense heat; and statistical tables prove, that Apoplexy and Palsy are rendered more frequent, either by unusually cold, or unusually hot weather *; and nearly the same may be said of other diseases, connected with irregular determinations of blood.

c. Muscular Exertion acting in like manner as external heat, to hurry the circulation, and urge to excess any local determinations that are already established, and especially such as are already attended with an excited state of the circulation, or such as exist in parts (*e. g.* the lungs or the brain) which must necessarily suffer from any strongly excited action of the heart. Those muscular efforts which are attended with *straining, i. e.* when the play of the lungs is forcibly restrained, at the same time that the blood is urged towards the heart, are necessarily peculiarly injurious, in producing congestion in the lungs, and in the great nerves, and thereby in the brain.

d. The partial Exercise of individual organs, particular postures of the body, and ligatures impeding the flow of blood in parts of the body, are all occasional causes of local congestions of blood, as is seen in many cases of hæmoptysis in those predisposed to it, excited by unusual exercise of the organs of respiration,—of menorrhagia excited or aggravated by the erect posture,—or by tight-lacing,—of apoplectic seizures or threatenings, from stooping, or wearing tight neckcloths, &c.

e. Mental Emotion or anxiety is frequently a cause of general hurry of the circulation; and must necessarily aggravate determinations to any individual organs which may

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* Thus the deaths from apoplexy in the severe winter of 1795, were to those in the milder winter of 1796, as 52 to 31, (HEBERDEN); and again, the deaths from apoplexy at New York in July, on an average of 11 years, were to those in any one other month, as 109 to 59, (RUSH).

at the time be peculiarly liable to disease. Thus many Apoplectic attacks and many cases of Menorrhagia in those predisposed to them, may be ascribed, in part, to this cause.

Impressions on the Nervous System at large, whether from mental or other causes, appear to act peculiarly on the circulation in the bowels, and in the uterine system. These parts (especially the intestines) are less affected than the contents of the head or thorax, by any sudden excitement of the heart's action; but the history of many diseases shews that, in women particularly, the circulation in them is very easily deranged by causes acting in the Nervous System, and such occasional increase of their natural secretions easily effected there, as implies increased determination of blood thither *. Indeed, diarrhœa is so apt to occur in cases of great debility, as to favour the supposition, that the mucous membrane of the bowels is a part in which the blood is always apt to accumulate or be congested, when it has difficulty in making its way through other textures.

When the blood is congested from these causes, or from unknown causes, in individual parts of the body, the symptoms resulting must of course vary according to the part affected, and the degree of the affection. And it is often difficult to distinguish those symptoms which depend on the ulterior consequences of the congestion of blood, from those which may be stated as the natural attendants of the circumstance of congestion itself, unconnected with any change in the products formed from the blood at the affected part.

In many instances the irregular determinations of blood

* See, e. g. LATHAM's History of the Epidemic in the Penitentiary in 1823, where there were many examples of violent disorder of the Nervous System, succeeded immediately either by hæmorrhage from the stomach or bowels, or by such mucous and watery discharges from these, as plainly denoted great increase in the flow of blood thither.

are attended with febrile symptoms, either preceding or fol-
lowing them.   But true febrile action, such as will be de-
scribed as accompanying inflammation, is not only no es-
sential concomitant of local congestions of blood, but may
most generally be distinctly traced to other causes ; either
to a degree of inflammation attending the congestion,—or
in some instances to inflammation supervening on hæmor-
rhage, to which the congestion has led,—or to some other
cause of febrile action affecting the body at the same time.
In some instances, however, attacks of disease which ap-
pear to depend on such determinations of blood, (e. g. fits
of Epilepsy in young and plethoric subjects) are attended
with general symptoms closely resembling inflammatory
fever, although we have no reason to think that inflammation
exists, and no other cause for fever appears.

Two classes of local effects which result from these de-
terminations and congestions of blood, may be shortly con-
sidered here, viz. those which may be produced by derange-
ment of the functions of the parts affected, without hæmor-
rhage or inflammation, or any kind of disorganization of
these parts; and those which may be produced by hæmor-
rhage independently of any ulterior consequences.   The
effects of inflammatory action, and of adventitious growths
or alterations of structure, consequent on the congestions,
will come under consideration afterwards.

I. 1. Very various derangements of the functions of the
Nervous System, headachs, giddiness, transient imperfec-
tions of sense, or of memory, fits of epilepsy, of hysteria or
other spasms, even of mania, in those predisposed to these
diseases, some cases of transient paralytic affections, and
many of apoplexy, appear to result from simply increased
afflux of blood to the brain, without rupture of its vessels,
disorganization of its texture, or even increased effusion of
its serous fluid.

2. There are many cases of asthma and of catarrh, which
may probably depend on merely increased determination of
blood to the mucous membrane of the air-passages; but

such cases are hardly to be distinguished from those either of inflammation or of spasm affecting these parts.

3. An increased determination of blood to the mucous membrane of the stomach, although not followed by inflammation there, is probably a frequent cause of severe dyspeptic symptoms *.

4. An increased flow of blood to secreting organs is certainly one condition, and in many cases probably the only condition, essential to the production of those diseases which consist in simple increase of their secretions, such as cholera, or many cases of diarrhœa and of leucorrhœa.

5. Even independently of attacks of hæmorrhage, there is evidence of increased flow of blood to the uterus, in many cases of uterine pains; and of a similarly increased flow to various other parts in connexion with nervous pains, *i. e.* pains which are unconnected with indications of inflammation.

6. An increased flow of blood to, or stagnation of blood in, the serous membranes, or the cellular membrane of the body in general, or of the lungs,—whether it be dependent on obstruction to the circulation in the great veins, as in cases of diseased heart or liver, or on suppression of excretion by the skin and kidneys, as in cases of dropsy after scarlatina, or connected with disease of the kidneys,—is the main condition essential to the occurrence of dropsical effusion in those parts; and is therefore a cause of diseases of such importance as to demand future consideration.

As true inflammation of cellular, serous, or mucous membrane is always attended with increase of the quantity of fluids thrown out there, it is obvious that effusions dependent on simple congestion of blood, and those dependent on inflammation, must often closely approximate; and the only essential distinction between them lies in the peculiar *alterations* of the products effused in these parts, which are effected by inflammation, and which will be afterwards described.

* See Parry's Elements of Pathology and Therapeutics, sect. 484.

Increased secretions or exhalations upon all these different membranes, although dependent, in most cases, and in the first instance, on congestions of blood there, are often attended with less general disturbance of the circulation, than the other effects of local congestion which have been mentioned. And there is this difference among the different membranes, that those determinations of blood which take place to serous membranes, and lead to dropsical effusions, are seldom effected without some kind of obstruction to the natural course of the circulation existing at the time; whereas the mucous membranes are often congested, and their secretions much increased, when no kind of organic disease or obstruction exists.

That these different diseased states depend essentially on morbid determinations or congestions of blood, even when these do not make themselves obvious either by hæmorrhage, or by any disorganizations perceptible on dissection, we conclude from various facts, most of which may be ranked under the following heads :

1. In many of these instances the symptoms are the same, and the whole history of the disease, up to a certain period, is the same, as in other cases, where the increased determination of blood is afterwards unequivocally shewn, either by hæmorrhage, or by such disorganization of parts as equally denotes congestion of blood there; e. g. a fit of apoplexy, in a plethoric person, after a full meal, and either mental agitation or intoxication, although preceded and attended with flushing of face, and heat of the head, may be fatal without any effusion being discoverable in the head; but after many cases of fatal apoplexy, of which the history was similar, we find effusions of blood or serum; and we cannot doubt that these latter cases illustrate the essential nature of the diseased action which took place in the former.

So also, urgent dyspeptic symptoms, following suppression of the menses, have often been succeeded, and immediately relieved by vomiting of blood; and this fact evidently illustrates the nature of the severe affections of the stomach which often succeed the suppression of that dis-

charge when there is no hæmorrhage. And the nature of many cases of diarrhœa is illustrated by what is seen in a few unusually violent cases of that kind, which are attended by severe hæmorrhage, even when there is no inflammation or ulceration, and no obstruction to the flow of the venous blood through the liver.

2. The nature of the diseases which have been represented as often depending on determinations of blood, is very often illustrated by their ready transition, in the same patient, into hæmorrhagic or inflammatory diseases. Thus we know that various combinations or successions of the symptoms and affection of the nervous system, above enumerated, and the cause of which may be thought doubtful if they stand alone, are often followed by regular apoplectic or paralytic attacks dependent on hæmorrhage in the brain; and that cases of simple diarrhœa are easily convertible, by errors of regimen, which in other circumstances would be innocent, into strictly inflammatory diseases.

3. The dependence of many cases of the diseases above enumerated, on the cause here assigned, is farther confirmed by a very sufficient experience of the *juvantia* and *lædentia* in at least a large proportion of cases of the kind, especially in their earlier stages; although experience also teaches that morbid actions which commence with increased local determinations of blood, and even with general excitement of the circulation, often subsequently go on for a long time, without any indications of increased vascular action, and when remedies are chiefly demanded by the general weakness of the circulation which subsequently ensues.

When diseases of the kind we have now considered prove dangerous or fatal, the immediate cause of danger may be very various, even although no farther morbid action be established than these natural effects of congestion.

Increase of the natural secretions from the serous or mucous membranes, when very copious, may be fatal in ways to be afterwards considered. There are, perhaps, cases

of affection of the lungs, and certainly cases of affection of
the brain, where the fatal event is produced by the obstruc-
tion of the functions of these parts consequent on mere
congestion of blood without farther change ; and there are
many cases of very various diseases, in which congestions
of blood in these organs are part of the cause of the fatal
event.   It is therefore of great importance to study the in-
dications of mere Congestion of Blood, as well as the effects
of Hæmorrhages, as they appear on dissection.

It may, however, be stated generally, that the indications
of local congestions of blood, observed after death, when no
farther consequence has occurred, are very liable to falla-
cies, and are not much to be trusted as proofs of the nature
of the preceding disease, unless the nature of the symptoms,
or other circumstances in the condition of the patient, con-
firm the conclusion which they suggest.

These fallacies result chiefly from what is known of the
unequal and irregular distributions of blood that may take
place at the moment of death, or within a very short time
before it, even in cases where there had previously been
little or no unusual determination of blood.

At the moment of death, or within a very short time
after it, congestions of blood in various parts and textures
(at least in the skin, most of the vascular parts, mucous
membranes, and the parenchyma of some of the viscera),
frequently occur ; which are not referable to any known
cause, but may be followed by transudation of serum after
death, and present appearances very similar to those of in-
flammation in its first stage.

A congestion of blood, with some serous effusion, is cer-
tainly often determined also by gravitation, acting before
death, but at the time when the circulation is very much
enfeebled, in those parts of the body which then lie lowest *.
This takes place especially, if any additional cause for slow
motion of the blood at the same time exists in these parts ;
as in the lungs, when there is any impediment to the free

* Hence the Peripneumonie des agonisans of LAENNEC, and the En-
gouement de Position of ANDRAL.

arterialization of the blood, or in the abdominal viscera, when the flow of venous blood is obstructed either in the liver or at the lungs or heart. A similar state of congestion and serous effusion sometimes occurs in the lower extremities from old age or extreme debility; and in any part of the body, if the veins leading from it are narrowed or compressed by tumors *.

Such congestions and effusions are of course most apt to take place in cases when the blood is in full quantity, and has less tendency to coagulation than usual, and therefore such fallacious appearances are seen most frequently after different kinds of violent death, or after contagious febrile diseases of short duration.

But when the same appearances are found in parts of the body where gravitation would not determine them,— when they are found under the circumstances stated above, as favouring local congestions of blood,—and when they correspond to symptoms observed during life, of embarrassment of the functions of the parts where they are formed, there can be no difficulty about regarding them as the effects and indications of morbid determinations of blood.

II. Hæmorrhage frequently takes place from the mucous membranes of the nose, fauces, bronchiæ, stomach or bowels, and still more frequently of the uterus; in some cases in such quantity as to be dangerous or fatal, by reason of the debility produced by the loss of blood, or, in the case of its occurring in any of the air-passages, by reason of the obstruction to respiration thence produced. When taking place from the inner surface of the uterus, at the moment of the separation of the placenta, it has often been fatal in persons previously quite healthy; but in the other parts mentioned it is seldom immediately dangerous, unless connected either with the morbid state of the blood, or with some of the obstructions to the free course of the blood, already mentioned. In all these parts, it often appears, on minute

* See ANDRAL Precis. d'Anat. Pathol. t. i.

investigation, that no rupture of vessels on the surface whence the blood came can be detected.

More rarely hæmorrhage takes place in like manner independently of injury or of perceptible rupture of vessels in the cellular substance, or on the surface of the serous membranes, even when uninflamed, and if this happen within the head or the chest, it may of course produce fatal coma or asphyxia. But the greater number of fatal hæmorrhages in any of the shut cavities of the body are the result of a diseased state of the bloodvessels.

Hæmorrhage within the substance of the brain is more frequently dangerous, and the effects it produces, and the disorganizations to which it tends, have been more carefully studied, than in other viscera.

It takes place most generally in persons advanced in life, and is preceded very frequently, though by no means uniformly, by the circumstances already mentioned, which favour,—by the causes which excite, and by the symptoms which indicate,—an increased determination to the head, and consequent obvious, although very various, derangement of the functions of the brain.

It takes place most commonly in the parts immediately adjacent to, or at least on a level with, the ventricles, the corpora striata, thalami, or adjoining parts; and in a large proportion of cases it appears obviously to have been facilitated by a diseased state of the vessels there situated. But in other cases, no disease of vessels is detected, and, in a few, the effusion of blood is in too many minute points to be ascribed to rupture of any but the smallest of the vessels.

It hardly ever occurs without sudden disturbance of the functions of the brain; but the amount of this disturbance is exceedingly various,—from transient loss of speech, or memory, or spasm or palsy of some voluntary muscles, up to perfect coma, fatal within a few hours. When the hæmorrhage has taken place into, and filled the ventricles, the amount of injury being more extensive than usual, the symptoms are more uniform; there is first, temporary loss of sense and voluntary power, and depression of the heart's

action,—a recovery from this state,—and then a gradual accession of profound, and uniformly fatal, coma. The most common permanent effect of effusion of blood into the substance of the brain is loss of sense, or of voluntary power, or both, in the opposite * side of the body.

That there should be much variety as to the affections of sense and voluntary power, in such cases, is not surprising, when we remember that the small portion of the contents of the cranium, which appear to be really essential to these functions, are seldom *directly* injured †; but the degree of variety that is observed in the affection, both of these and of the strictly mental powers, and in the permanence of that affection—even when the parts actually injured are the same, is certainly greater than could have been expected.

The sudden attack of symptoms indicating effusion of blood in the brain, is often preceded or followed by fever and other symptoms, which may excite suspicion of inflammation of the brain; and when death takes place within a short time after the hæmorrhage, marks of inflammatory action are often found combined with it, especially effusion of serum into the ventricles, and softening, and other inflammatory appearances (afterwards to be considered) around the effused blood. In some such cases, the clot of blood has probably excited the inflammation, of which the effects appear around it; but in others, there is good reason to believe that the inflammation, and even the softening, took place first, and that the hæmorrhage was consequent on the injury done by the inflammation and its effects, to the coats of the vessels of the part.

When no such amount of disorganization attends the effusion of blood, and when the immediate effects of it on the functions of the brain abate, the changes consequent on it are, that a thin layer of coagulable lymph is thrown out around it, and becomes gradually organized (by the inflammatory action which it excites, and which will be afterwards explained); and that the colouring matter of the blood, and afterwards the rest of the coagulum, are

* See Physiology, p. 112.   † Ibid. p. 131.

gradually absorbed from the interior of the preternatural cyst thus formed, which is then left, containing only a yellowish fluid, and afterwards shrinks farther, but never entirely disappears. It is certain that the absorption of the coagulum may be effected in this way within three months after its effusion *. This process is attended with a gradual, but variable, and very seldom complete, recovery of those functions of the brain and nerves which had been impaired.

Effusion of blood into the substance of the lungs is not so common as into the brain; the effusion, in most cases of hæmoptysis, being either into the bronchiæ, or into ulcerated cavities; but it takes place occasionally, and has been accurately described under the title of Apoplexy of the Lungs; and the history of the organic lesion thus effected is important.

It takes place very seldom when there is no other organic disease within the chest; occasionally when there is other disease of the lungs, limiting and obstructing the circulation; but much more frequently when there is disease of the valves on the left side of the heart, and consequent impediment to the movement of the blood there. It is most generally attended with hæmorrhage into the bronchiæ and hæmoptysis, but the amount of that discharge bears no proportion to the extent of the effusion, and sometimes, even in fatal cases, it is altogether awanting.

Besides the hæmoptysis, the effusion of blood into the air-cells must naturally produce sudden dyspnœa, and disorder of the heart's action; and when it is in any considerable quantity at one spot, it must obscure or suppress the natural respiratory murmur, and even make that part of the chest dull on percussion; but these last indications are equally given by various other lesions, to be afterwards mentioned. When, however, they take place rapidly, with sudden dyspnœa, with hæmoptysis, however slight, and especially in a case where there are indications of diseased heart, it may be suspected that they proceed from this cause; and in such cases, the affection is sometimes rapidly fatal.

The appearance in the dead body of the lesion of the

* See ABERCROMBIE's Pathology of the Brain and Spinal Cord, p. 271.

substance of the lung, thus caused, is just that of a coagulum of venous blood filling up a part of the cellular texture. The colour is darker and more uniform, the texture is firmer, and the edge more circumscribed, than in the case of effusions from inflammation.

Blood thus effused into the substance of the lung, does not appear so rapidly to excite inflammation around it, as in the brain; and it is not, therefore, found afterwards to be surrounded with any cyst; but in the lungs, as in the brain, and as in the cellular substance after bruises, such simple effusions of blood, in the perfectly healthy state, appear to be easily absorbed; and judging both from the gradual improvement of the general symptoms after many cases of hæmoptysis, with much dyspnœa (unconnected with phthisis), and from the gradual abatement of the indications of effusion given in such cases by auscultation and percussion *, we may presume, that large coagula of blood may be absorbed from the cellular texture of the lungs, and the functions of the part gradually restored; although the complex and necessarily dangerous nature of most of the cases, where this accident happens, prevents our having many examples of this kind.

Blood is sometimes effused into the substance of the liver, and presents there the same appearance as in the lungs. This happens chiefly when there is congestion of blood in the liver, consequent on disease within the chest. In some instances, also, it is found surrounded by adventitious substance, or softened portions of the glandular substance, as so often happens in the brain; and there are similar reasons, in some such cases, for believing the latter to have been the primary change †. But it is beyond our power to discriminate this change in the substance of the liver before death, from mere turgescence of the bloodvessels, and its other effects, to be afterwards mentioned.

There are some cases, in which coagula of blood, apparently unchanged, are effused from disease into, and gra-

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* See Laennec, t. i. p. 383.

† See Andral, Precis. d'Anat Pathol. t. ii. p. 604.

dually distend, the Graafian vesicles in the ovaries; but on what this depends, or whether it can be suspected from any particular symptoms, is uncertain.

In all these situations, as well as in others, where effusions of blood from disease are less common, we have reason to believe, that the blood effused in a few cases becomes an organized mass, and then is gradually converted into different kinds of tumor. This we gather from careful examination of some instances of the kind, where successive effusions have taken place, and are found at the time of death in different stages of their progress *. But as many facts inform us, that blood effused in the perfectly healthy state is readily absorbed, it is obvious that there must be some constitutional peculiarity in the cases, where such transformation of effused blood takes place.

In a much greater number of cases, we have good reason to believe, that congestions of blood lead to the formation of adventitious textures (very little liable to absorption) without any hæmorrhage. But the consideration of all these is more properly delayed, until after we shall have examined the process of inflammation ; which is probably the most frequent, and certainly the simplest case of the formation of new products in the animal economy in consequence of disease.

CHAPTER VI.

OF INFLAMMATION.

Inflammation is, on many accounts, the kind of diseased action in the living body, which must occupy the largest share in all pathological discussions. It is that which is the most easily excited by external causes, and is indeed the only one, not necessarily fatal, which we have the means of exciting at pleasure ;—its effects, varying exceedingly in different organs, and in different circumstances,

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* See *e. g.* ANDRAL, Precis, &c. t. ii. p. 589, & 764.

bear a close resemblance to, and therefore illustrate, and very often combine themselves with, all other modes of diseased action, of which the body is susceptible; under favourable circumstances, it is more completely under the control of remedies than any other; and nevertheless, it is more or less concerned in producing a very large share of the mortality in every part of the world.

SECTION I.

OF THE SYMPTOMS OF INFLAMMATION IN ITS FIRST STAGE.

THE name given to this, as to many other diseased states of the body, expresses nothing as to its essential nature; but the condition to which this name is applied, is in general held to be characterized in any part of the body, by the concurrence of four symptoms, Pain, Swelling, Heat and Redness; symptoms which in external parts at least are easily recognized, without requiring such minute examination as is requisite when we investigate the intimate nature of the disease. Of these the first, although often the most urgent, is in fact the least constant symptom. It is much felt in external inflammations, and in those which affect the outer coverings of the different viscera, but is little felt in some cases of inflammation of the internal membranes, and of the substance of viscera, (perhaps because the parts affected in those cases have fewer nerves of common sensation); and is often excited only by occasional impressions made on the affected parts. The increased temperature, in all probability, exists in every case of inflammation; but it seldom amounts to more than a few degrees; it is of course often concealed from the observer; and as the sensibility to heat is less general over the body than the susceptibility of common sensation, the heat of inflammation is less generally felt by the patient than the pain.

The swelling and redness, although very various in degree, in form, shade of colour, &c. in different cases, and

often concealed from view, likewise exist, more or less, in every case of inflammation; and depend, in the first instance, not on any extravasations, but on the distension of the small vessels of the part, and on the passage of the colouring matter of the blood into vessels which had before hardly, if at all, admitted it.

But in order that Inflammation may be clearly distinguished from all other states of any living texture, it is necessary to add to these four characters two other distinctive marks, 1*st*, That the affection should remain fixed in the part for at least some hours;—and, 2*dly*, That unless the affection be speedily and artificially arrested in its course, more or less of *extravasation* should shew itself from the vessels of the part, first, of the serous part of the blood only, but afterwards of a more glutinous fluid, or even of solid matters,—constituting the different inflammatory effusions to be presently considered. This last character, drawn from the local effects rather than the symptoms of Inflammation, is the only sure mark of distinction between this state and mere Congestion of blood, already considered.

These are the characters which appear, on careful consideration of the phenomena of Inflammation in all parts of the body, and after exclusion of all individual and local peculiarities, to be the most uniformly present, and therefore the most essential parts of its history, in its earliest stages. But in many individual cases, these are in a great measure concealed from view; and, in order both to secure the recognition of this condition of individual parts, and also to understand the manner in which it gradually deranges the living actions of other parts, and endangers life, it is necessary to observe minutely and generalize the *effects* which are found by experience to result from it,—*first*, in the condition of the system at large; *secondly*, in the *functions* of individual organs,—either those that take on the diseased action themselves, or those most closely connected with them.

Afterwards we shall consider the effects of inflammation

on the structure and properties of the parts that are actually inflamed ; which last effects, although often the most important of all, are generally the latest in point of time.

I. The effects of local inflammation on the system at large, may be ranked under two heads, I. The inflammatory fever, and, 2. The inflammatory state of the blood ; both of which very generally attend inflammation of any considerable extent and intensity, and in many cases bear a tolerably uniform proportion to its amount.

Of the combination and succession of symptoms which constitute the state called Fever, it is generally allowed that the most uniform and characteristic are (as stated in CULLEN's definition of Pyrexiæ) a sense of coldness and debility, succeeded by increased heat of skin, and increased frequency of pulse, and by a general derangement of the other functions, of which continued debility of the voluntary muscles is an important part.

The general derangement of functions, during the febrile state, may be thus arranged.

1. During the first, or cold stage (which is almost always observed, and always very important to be marked, as fixing the date of the febrile attack), there is very generally, for a short time, besides the increased frequency of pulse, more or less of depression or debility of the heart's action, and afterwards an increase of the force, and sharpness or quickness of its pulsations, as well as of their frequency, to which change, and the concomitant rise of temperature, the term *Febrile Reaction* is properly applied.   In the decline (whether temporary or permanent) of the febrile state, the usual change is in the pulsations becoming softer, or taking place more slowly, as well as becoming less frequent ; but there may be many variations in the pulse in the course of fever, before that improvement takes place.

2. The functions of Secretion, Exhalation, and Nutrition, in all parts of the body, are more or less diminished during the febrile state ; as appears from the surface being more

parched, or any sweat being temporary, and ineffectual in cooling the surface; from the mouth and tongue being clammy, or dry, with the feeling of thirst; from the appetite being deficient, and digestion imperfect; from the bowels being costive (unless there be a special affection of their mucous membrane); from the urine, sometimes limpid and abundant in the cold stage, soon becoming high coloured, and often turbid and acrid; from the morbid secretion of ulcers, and the morbid exudation of eruptions on the surface, usually abating or disappearing; and from the general wasting of the body.

3. The Respiration is often somewhat irregular, and attended with a sense of anxiety in the cold stage of fever, and becomes always somewhat more frequent than natural, when the febrile reaction is established; and the Heat of the surface becomes greater than natural at the same time, although by no means in exact proportion to the strength and frequency of the pulse.

4. The functions of the Nervous System are very often and variously affected during the febrile state. 1. The *sensations* are generally somewhat blunted in the first stage, when the febrile depression is most strongly marked, and often morbidly increased, at least partially, when the reaction is established. Pains of the back and limbs, and more especially of the head, are also natural accompaniments of the earlier stages of fever, independently of any inflammation in the parts pained. 2. There is in general disinclination to voluntary muscular exertion, and *debility* on attempting it, so important as to be introduced into the general definition of Fever; but there is occasionally, during the febrile state, especially when the more active kind of delirium is present, an excitement and transient morbid energy of voluntary action, even when the circulation has become feeble; and there is more frequently, during some part of the febrile state, irregular and involuntary action of the voluntary muscles, tremors, subsultus tendinum, or even convulsions. 3. There is always, during fever, more or less affection of the *mental faculties;* at first a degree

of torpor, which is often succeeded, when the reaction is es-
tablished, by a morbid rapidity, and more generally by a
morbid energy, of the different mental acts composing the
train of thought, with a peculiar difficulty of exerting the
power of voluntary attention, from which there naturally
results some confusion of thought, and often such halluci-
nation as characterizes delirium * ; and this febrile condi-
tion of the mental faculties often blends itself with, or
passes gradually into coma.

It is chiefly by greater or less predominance of different
parts of the combination of symptoms now sketched, that
the species of varieties of Fever are distinguished from each
other ; and that called *Inflammatory Fever*, which most
commonly attends inflammation, is especially denoted by
the following circumstances. 1. That the febrile reaction
of the vascular system is stronger, and more enduring ;
2. That there is less derangement of the secretions ; and
3. That there is less disorder of the nervous system,—than
in those fevers which cannot be so distinctly ascribed to lo-
cal inflammation as their cause.   On the other hand, when
the vascular reaction is feebler, or less permanent, the de-
rangement of the secretions more obvious, and the ner-
vous system earlier and more decidedly affected, and espe-
cially if that affection shews itself by depression, and ten-
dency to stupor, rather than by more active delirium, the
form of fever is said to be *typhoid*.

Several other circumstances, in regard to the Fever which
accompanies Inflammation, demand notice.

1. Although the febrile symptoms are generally regarded
as the effects of the local inflammation, and accordingly,
are generally posterior to some part of the local symptoms
in date, yet there are instances,—not only in the case of spe-
cific inflammations attending febrile exanthemata (of which
the whole pathology is different),—but of simply inflamma-
tory diseases, pneumonia, cynanche tonsillaris, mastodynia,
&c. where the febrile attack precedes any local symptoms ;
and perhaps may contribute to excite them.   And there are

* See Physiology, p. 220.

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other cases, particularly in irritable constitutions, where the febrile symptoms last for a time (*e. g.* a few days), after the local symptoms of inflammation have subsided, and where these do not recur.

2. Although intense and extensive inflammation is usually attended with high fever, and *vice versa*, yet the proportion is by no means uniform. The degree of febrile symptoms, attending a given extent of inflammation, is generally increased by youth, plethoric habit, and sanguine temperaments, and lessened by the reverse of these. In some, even vigorous constitutions, the degree of fever excited by active inflammation is slight; and there are some organs, as the tonsils, the inflammation of which is frequently attended with a degree of fever quite disproportioned to their size, or importance in the system.

3. Although the febrile symptoms attending the earlier stage of inflammation have generally the character of inflammatory fever, as above distinguished, yet deviations from this type of fever are frequently seen, and may be referred to two heads, as they depend either, *first*, on the peculiarity of the part affected, or *secondly*, on the action of some other cause influencing the system simultaneously with the inflammation itself.

Of the modification of the fever of inflammation by the part affected, the most important instance is in the case of inflammation of the Stomach and Intestines; where the fever is characterized by an early and often very rapid depression of the heart's action, strongly resembling, and evidently illustrated by, the effect on the heart's action of violent injuries of the abdomen, which was already considered. An effect somewhat similar results from active inflammation of the kidneys, uterus, bladder, and larger joints.

The modification of the fever of inflammation by the action of a concurrent cause affecting the system, is remarkably seen, 1. In the case of inflammation from an injury which has given a violent shock or Concussion; 2. In the case of inflammation occurring in a constitution in which the nervous system has been habitually influenced

by peculiar Stimuli, such as alkohol taken in excess; 3. In the case of inflammation attended with the introduction of peculiar animal Poisons into the system.

In all these cases, the fever attending inflammation shews a less forcible and less enduring reaction, and is attended with more derangement, both of the secretions and of the functions of the nervous system, than is usual; and therefore assumes, more or less exactly, the form to which the term *typhoid* is applied.

The state of the Blood which usually attends inflammation, of considerable intensity, is that in which it shews the Buffy Coat, *i. e.* in which a separation, more or less complete, of the fibrin from the colouring matter of the crassamentum takes place spontaneously during coagulation.

It was formerly stated, that this separation does not depend on the circumstance of slow coagulation of the blood, and consequent subsidence of the colouring matter, but that there appears to be in this state a repulsion between the particles of the fibrin and the red matter; causing them to separate from each other before the fibrin has become solid, or in films so thin, that they separate laterally instead of vertically. This repulsion may or may not coexist with a strong aggregation of the particles of the fibrin among themselves; but in most cases of violent inflammation there is both the complete separation and the strong aggregation; the effect of which is a buffy coat, both thick and strong, *i. e.* contracted.

A thin buffy coat, implying imperfect separation of the fibrin from the colouring matter, usually attends cases of slight or very partial inflammation only. A thick, but loose, flabby buffy coat, implying more separation from the colouring matter, but weak aggregation of the particles of fibrin among themselves, is generally observed where another cause of general disease of the system (*e. g.* contagious fever) coexists with local inflammation. It appears from the observations of GENDRIN, that the proportion of albumen in the serum of sizy blood, and especially in that

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part of the serum which is entangled in the buffy coat it-self, is much greater than in the serum of healthy blood.

The buffy coat is seen on the blood in some persons, chiefly of a plethoric habit, without inflammatory disease existing in them, and is often found in the blood of pregnant women, but in these cases it is seldom thick or very firm. The formation of the buffy coat, though not dependent on slow coagulation, is of course facilitated by that circumstance; and when coagulation is much hastened, a complete separation of the parts of the crassamentum cannot take place. Hence blood which is drawn in a small stream, or spread over a flat surface, as its coagulation takes place quickly, is not apt to shew the buffy coat; and this is probably also the reason why blood drawn from weakened or fainting persons, which is more serous, and coagulates more quickly than most venous blood, seldom shews the buffy coat; and why the last drawn blood in a bleeding on account of inflammation, is usually the least sizy.

In a few cases the last drawn blood is the most sizy, and that especially when the pulse, previously depressed, becomes fuller and stronger by reason of the bleeding; probably because the capillary circulation becoming more free, and more serum being admitted there, the blood in the large veins then becomes less serous, and the coagulation takes place more slowly *.

Inflammation, even when violent, generally lasts for a day or two, before it causes the blood to shew the buffy coat. It is not yet ascertained whether the blood in the veins leading from an inflamed part, becomes sizy sooner than that in other veins of the body; but microscopical observations on the changes which take place in the blood in the capillary vessels of an inflamed part render this supposition probable.

II. The concurrence of the symptoms already considered is generally sufficient to indicate the existence of inflamma. tion, even when seated in internal parts; but there are al-

* See Physiology, p. 46.

most always more local symptoms, indicating a peculiar
derangement of the function of some particular organ,
which enables us more decidedly to fix on the seat of the
inflammation.   These local symptoms are such as denote
alteration of the function, either of the part that is inflamed,
or of an adjoining part, or of a part connected with it in
function, or by known sympathies, although not adjacent.

1. When any internal part is inflamed, its own functions
are in general perceptibly, though somewhat variously alter-
ed.   Thus inflammation of the heart and large arteries
causes generally preternatural, and sometimes irregular
impulse of the heart, inflammation of the lungs causes
dyspnœa, and soon alters the sound produced by the air en-
tering the lungs; inflammation of the serous or synovial
membranes causes increase and alteration of the serum na-
turally effused into these cavities, which often becomes ob-
vious to the observer; inflammation of the mucous mem-
brane of the air-passages or bowels, leads to increased and
altered secretions there, and consequent *profluvia;* inflam-
mation of the serous, or perhaps more especially of the mus-
cular coat of the bowels causes costiveness ; inflammation of
the kidneys alters the composition of the urine, that of the
bladder renders its excretion difficult and painful; inflam-
mation of the brain leads generally to derangement of some
part of its functions, to palsy, spasm, delirium, or coma;
inflammation of the eye or ear augments the sensibility to
light or sound, while inflammation of the lining membrane
of the nose blunts the sensibility to smells ; inflammation
of muscles or their coverings, or of motor nerves, greatly
impedes or wholly prevents the motion of the parts they
are destined to move.

But there are many cases of important, at least apparent
exception to this rule, especially in the case of those inter-
nal viscera, the whole of which is not required for the out-
ward manifestation of their functions.   Thus a portion of
the liver may be inflamed, without the flow of bile being
perceptibly altered ; and experience shews, that portions
of the lungs, and of the brain, may be inflamed, without

the usual alteration of the functions of these parts being observed.

2. Alteration of the functions of parts adjoining those that are actually inflamed, is seen in the painful and difficult deglutition caused by inflamed parotids, tonsils, or larynx, in the painful and difficult descent of the diaphragm, when the peritoneum or liver is inflamed, &c.

3. When inflammation of the liver causes pain of the right shoulder, inflammation of the bladder pain at the point of the urethra, inflammation of the spinal cord pain stretching round the abdomen, or inflammation of the hip-joint pain at the knee, we have examples of the phenomenon considered formerly under the name of Sympathetic Sensation : And when inflammation of the brain, liver, stomach, bowels (especially their serous coat), kidneys or bladder, causes vomiting, the diaphragm and abdominal muscles take on a Sympathetic Action ; the sensations which excite them to the act of vomiting being excitable by irritation of all these parts. Again, when inflammation of the mucous membrane of the trachea or bronchiæ causes violent and painful cough, when that of the colon or rectum causes painful and ineffectual tenesmus, or that of the mucous coat of the bladder causes strangury, the actions excited are only an excessive degree of those Sympathetic Actions of various and sometimes distant muscles, which the natural sensations of these parts excite, for useful and important purposes. And in all these cases, the sympathetic phenomena, when coexistent with other symptoms of inflammation, are an important indication of its seat.

In concluding this sketch of the symptoms by which inflammation is distinguished in its earliest, and, in a practical view, its most important stage, it is right to notice the circumstances in which it is most common to observe symptoms nearly resembling those of inflammation, although it does not exist; and again, those in which it has been often found that internal inflammations may exist, without their usual indications being distinctly perceived.

Pains in the most sentient parts of the body, equally in-

tense as those of inflammation, occur pretty frequently, especially in persons of nervous temperament, and in those liable to hysteria and hypochondriasis, without being connected either with inflammation or with any perceptible change of structure. In women, in whom the sanguiferous system is in general easily excited, a part at least of the symptoms of general fever will often accompany such nervous pains. In young persons especially, congestions of blood often leading to hæmorrhages, and which will be afterwards mentioned as specifically distinct from inflammations, will often, for a time, excite very similar symptoms, both general and local. And in children, fever is easily excited, both by inflammation and other kinds of local diseased action, and bears no fixed proportion to the degree of local disease from which it may originate.

On the other hand, the cases in which inflammation is attended with least of its usual symptoms, either local or general, are chiefly those in which it affects internal parts, during a state of great debility and emaciation, e. g. in convalescents from acute diseases, especially if advanced in life*. And when occurring in the course of a disease in which the sensibility is greatly impaired, as in continued fevers, some of the symptoms of inflammation are much concealed. It is in these circumstances that the most striking examples of *latent inflammations*, requiring peculiar attention in order that they may be recognised, have been observed.

SECTION II.

OF THE LOCAL EFFECTS AND TERMINATIONS OF INFLAMMATION, AND THE SYMPTOMS THENCE RESULTING.

In strict language, there are only two *terminations* of the inflamed state of the vessels of any part, viz. that by Resolution, or return of these vessels to their previous condition, and that by Mortification or sloughing, i. e death of

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* Les pleurisies les plus graves sont ces des sujets les plus debiles, des cachectiques, des hommes affaiblis par des exces quelconques, par la syphilis, la goutte, le scorbut, le cancer, et surtout par l'age."—LAENNEC.

the part. But it has been already stated, that different effusions from the inflamed vessels take place in almost every case of inflammation; these effusions very often continue, and sometimes become the seat of farther morbid changes, after the inflammation has subsided or been resolved; and hence, these effects of inflammation have often been called terminations of it; although most generally the resolution of the inflammation does not take place till some time after these effects have appeared.

I. In regard to the termination of inflammation by resolution, (which term is applied whenever the effusions from inflammation are so slight and transient as to cause little or no inconvenience and demand no treatment), several facts demand attention.

1. In all parts of the body, the spontaneous tendency to this termination of inflammation is strongly marked, (whether other consequences result from the inflammation or not) although the time within which this tendency begins to shew itself, may vary from a few hours to many days or weeks, according to the intensity of the inflammation, and according to various circumstances which will be stated under the head of Varieties of Inflammation.

2. When inflammation is established at any part of the body, it very generally extends itself more or less to the neighbouring parts, before subsiding; and frequently the decline of the inflammation, in the part first affected, is followed by an extension of it in the surrounding parts. This extension is more obvious in some varieties of inflammation, to be afterwards described, than in others. The extension of inflammation takes place more rapidly along any one texture, than from one texture to another immediately adjoining; e. g. more readily along the peritonæum, or mucous membrane of the bowels, than from either of these to the other; more readily along the membrane lining the bronchiæ, or along the pleuræ, than from the bronchiæ to the substance of the lungs, or from the pleura costalis outwards; although intense inflammation may spread rapidly through various textures.

It is very remarkable, that in spreading over a single texture, such as the peritoneum covering folds of intestine, inflammation evidently extends itself, not only along continuous surfaces, but to surfaces adjoining to, or in contact with, that first affected, although not continuous with it, or united with it by any material bond of union.

3. In some inflammatory diseases there is a peculiar tendency of distant parts (generally, however, consisting of the same or similar textures) to become inflamed, and run the usual course of inflammation successively, as in gout, rheumatism, cynanche tonsillaris, or inflammation of the testes.

4. In a few cases we observe a sudden and unusual resolution of inflammation in a part first affected, followed immediately by its appearance in a distant part, to which the term *metastasis* is properly applied. This occurs chiefly, perhaps exclusively, in the case of those inflammations which we shall afterwards describe as *specific, i. e.* as presenting decided marks of distinction, from the inflammations seen in other instances in the same parts or textures, *e. g.* in Gout, Rheumatism, Erysipelas, Gonorrhœa, Cynanche parotidæa.

II. The first effect of inflammation in any texture, often perceptible in the living body, and more generally in the dead body, is Congestion of blood in the small vessels, with some Effusion of the serous part of the blood. Where the symptoms of inflammation, during life, have been well marked, these appearances may in some cases be all that may be found after death. But if no farther effects of inflammation are observed, these are not sufficient of themselves to entitle us to affirm that the part has been inflamed ; as is sufficiently proved by what has been formerly said of the difficulty of judging even of the congestions of blood having taken place at any distance of time before death, from such appearances only.

There is probably a distinction between any appearances resulting from mere congestion of blood, and those of genuine inflammation in its early stage, in the colour of the af-

fected parts, which in the latter case is more florid; but this difference is to be depended on only if the parts are examined within a very short time after death.

The very early effusion of serum from inflammation is most distinctly seen in certain cases of inflammation affecting the skin, and in the inflammation of serous and synovial membranes, and of the substance of the lungs, where it takes place almost from the very commencement. The effusion of serum on the pleura causes in a very short time the dull sound on percussion, and the absence of respiratory murmur, at that part of the chest, and in some such cases, while the quantity effused is still small, the modification of the voice, heard when the ear is applied to that spot, and termed Œgophony, may be distinctly perceived. The effusion of serum into the cells of the lungs causes the modification of the respiratory murmur called Râle crepitant, which, however, is a symptom of short duration, and is followed by total suppression of the murmur. The same effusion takes place behind the mucous membrane of the air passages, in cases of œdema of the glottis, consequent on inflammation there, and often rapidly fatal; and to the same cause we must ascribe the increased quantity, diminished consistency, and altered qualities, of the secretion of the mucous membranes soon after the commencement of inflammation in them; and the diminished cohesion, or softening, from incipient inflammation in these membranes, and in most of the parenchymatous viscera,—the brain, liver or kidneys. Part of the swelling in inflammation of the cellular texture is owing to the same effusion, and there are some cases in which œdema, extending to some distance from the inflamed part, is consequent on inflammation of the cellular texture. But the serous effusions of the first stage of true inflammation are *more limited in extent* than dropsical effusions, and are quickly followed by other exudations. No great extent of dropsical effusion is ever the effect of local inflammation only; although we shall afterwards find that different inflammatory diseases, by the obstructions to the free movement of the blood which they ultimately produce or aggravate, frequently assist in the production of dropsy.

III. As inflammation advances, it would appear that the fluid effused from the vessels becomes of a thicker or more gelatinous consistence, and there is soon a distinct effusion of the coagulable lymph of the blood, characterizing the *Adhesive stage* of the inflammation.

This effect of inflammation is most distinctly seen in the formation of adventitious membranes, which are frequently found on the free surface of the serous membranes when inflamed, and by which the opposing parts of that surface, in the thorax or abdomen, are often united. But a similar deposit is often seen on the surface of the skin, from intense inflammation and vesication, and often likewise succeeds inflammation of the mucous membranes in some parts of the body, as in the larynx and trachea in croup, or in parts of the great intestines in dysentery. It is by a similar exudation of coagulable lymph on the surface, or into the interstices of textures, that either the membranes already mentioned, or the fibrous or synovial membranes, become thickened and corrugated; that the cornea becomes white and opaque, or the iris partially loaded, discoloured and irregular; that the cellular substance in any part becomes dense and hard, in common phlegmonous inflammation, and in many cases of erysipelas also; that the spongy texture of the lungs becomes mottled with reddish or whitish granulations, in what is usually called hepatisation from peripneumony; and that enlargement and condensation of other of the parenchymatous vicera result from their inflammation, and precede the other consequences of that process. Where the bloodvessels or valves connected with them are themselves inflamed, a similar exudation thickens these coats, and often lines part of their inner surface, and obstructs the flow of blood along them. And in all textures, when ruptured or lacerated, this kind of effusion, consequent on the inflammation excited, is the most essential step towards the reparation of the injury.

The lymph thrown out is probably always at first semi-fluid, and is soft and flocculent for some time, but the serous part of the effusion is soon absorbed, and, if the inflam-

mation proceeds no farther than this stage, the fibrin effu-
sed becomes gradually of firmer consistence, and soon
shrinks remarkably in bulk. From this cause, there is fre-
quently much hardening of various parts of the body, as
of the skin and other membranes, and of different viscera,
consequent on their inflammation, after it has lasted some
time, and especially when it has not been very intense.

In some cases, much of the colouring matter of the blood
is thrown out with the coagulable lymph on inflamed sur-
faces. This takes place especially in the cells of the lungs
in peripneumony, on the serous membranes of the chest in
certain pleurisies, and on the mucous membrane of the
great intestines in dysentery. And in most cases, when
the effusion of lymph has been considerable, reddish striæ
are seen in it after a time; and these subsequently assume
the appearance of small vessels, stretching across the ef-
fused lymph, generally in a pretty straight direction, contain-
ing fluid blood, and communicating freely with the vessels
of the textures originally inflamed. The power of forming
these vessels in the lymph effused, is the vital property to
which the term *plasticity* has been applied. When this is
the case, the matter effused has the appearance and pro-
perties of condensed cellular substance, so that the ulti-
mate result of this *adhesive inflammation* is to make this
addition to the organized textures of the body.

There is very great variety in the length of time requi-
site for these effects of inflammation to take place. There
are many instances of intense inflammation, in which much
solid lymph is thrown out, within thirty-six hours from
the commencement of inflammation; and cases have been
quoted, in which it was thought that the vascular organiza-
tion of such lymph has been effected within that time, but
in general it would seem that several days are necessary
for this last process.

It is by this inflammatory exudation, and subsequent
organization of lymph, that the permanent adhesion of sur-
faces which have been inflamed is effected,—that parts,
recently removed from the living body, may be reunited to

any surface, which is in the requisite stage of inflamma-
tion,—that permanent additions are often made, by attacks
of inflammation, to the thickness or bulk of membranes
and other textures, and that wounds are healed, and ulcers
filled up, and all breaches of texture permanently repaired;
a part of the matter which is effused in these last cases
gradually assuming the appearance and properties of the
texture which has been removed. The conditions most
favourable to this effect of inflammation, are a moderate de-
gree of the inflammation, a certain vigour of vascular action,
seclusion from air, and the absence of all other irritations.

Coagula of entire blood, effused on living parts, have ap-
peared in some cases to become vascular and organized,
but certainly are in general easily absorbed again, and do
not undergo that change nearly so readily as the effusions
of lymph from inflammation.

Various facts prove, not only in the case of injury of
bone, but likewise of some of the soft textures, (as the skin
and mucous membranes), that the matter which thus as-
sumes the properties, and repairs the losses of the texture
that has been injured, is thrown out not only by the vessels
of that texture itself, but likewise in part by those of ad-
joining textures, which have taken on this form of inflam-
mation. In cases of disease it probably often happens, that
the matter thus thrown out by inflammation, instead of
assimilating itself to the texture which has been injured,
either acquires the properties of other textures, or de-
generates into structures which differ from any found in
the healthy body.

IV. The next effect of inflammation is Suppuration or the
effusion of Pus, which is at once distinguished by its opa-
city, fluidity, and yellowish-white colour, and appears, on
minute examination, to contain great numbers of globules,
somewhat larger than those of the blood, and shewing as
little tendency to cohere together as those of the blood in
the living body do.

In some instances, pus gradually mixes itself with the

effusion of serum in inflamed parts, without other change; but most generally, the formation of pus is preeeded both by effusion of serum and of eoagulable lymph; and the purulent effusion is bounded more or less definitely by the lymph thrown out around it, so that if the abseess forming be near the surface, fluetuation becomes perceptible in it; as in the case of common absceesses in the cellular membrane, where the pus is formed in the centre of the part previously hardened by effused lymph; or in the ease of pustular eruptions (such as smallpox) on the skin, which are set on a hardened base, formed chiefly by effused lymph.

In the advanced stages of inflammation of the skin, cellular membrane, fibrous and synovial membranes, serous membranes of the head, chest or abdomen, parenchymatous viscera, and bloodvesscls, effusions of pus are very generally found mixed with the adhesive lymph that has been thrown out, but in very various modes and proportions in different cases, and in inflammation of different textures. On the skin and serous membranes it is often thrown out for a length of time, and in much larger quantity than the lymph; in the substance of the viscera it is formed more sparingly, and when formed, secms to distend and narrow the cysts of lymph by which it is surrounded more gradually. In the cellular texture of the lungs it is seldom formed, in consequenee of aetive inflammation, into circumscribed absceesses, but is gradually infiltrated or diffused through the wholc inflamed part. On the mucous membranes of the air-passages (ineluding the tuniea conjunetiva of the eye), and urinary passages only, it is frequently effused and mixed with the other seeretions of the parts, even from simple or healthy inflammation, without any previous distinct exudation of plastie lymph. In all other textures, when thc effusion from inflammation is puriform only, it may probably be concluded that the inflammation is of a peculiar or speeific character.

The length of time requisite for inflammation to last before pus is distinctly formed, varies from a few hours (in the ease of the urethra) to several weeks. The length of

time that suppuration, once established, may continue in a part, is still more various; and the intensity of the inflammatory symptoms that may precede or accompany the suppuration, bears no fixed proportion to its amount or duration.

When the formation of pus ceases, in a circumscribed abscess, the cavity is gradually filled up, partly by the surrounding parts that had been compressed regaining their previous form and bulk, and partly by the organization and subsequent contraction of portions of the lymph thrown out along with or after the pus, and which take the form of granulations.

The effusions of adhesive plastic lymph, and of fluid pus, from inflammation, are very distinct in their progress and effects, but in their origin it is obvious that they are very closely allied. In cases of pleurisy or peritonitis, detached flakes of lymph, mingling with the serous effusion, appear to constitute the first step to the formation of pus; and in rapidly fatal cases of various inflammatory diseases, the glutinous exudation that is found often appears to be intermediate betwixt lymph and pus. On the surface of the body, it has been observed that the character of the inflammatory exudation is much determined by the circumstance of exposure to the air, the same surface which throws out pus when exposed, forming plastic lymph when protected from the air. And the same influence of exposure to air, in promoting the formation of pus, may be observed in comparing the effect of inflammation of the free surface of the mucous membrane of the urethra, in gonorrhœa, with that of the attached surface of the same membrane, which causes exudation of lymph, and so leads to stricture. So also that inflammation of the pleura, which is consequent on admission of air into the cavity of the chest, leads, more surely than any other, to copious purulent effusion, or empyema; and in the later stages of pneumonia, if the patient live so long, much of the lymph thrown out into the air-cells appears to be converted into pus, constituting the purulent infiltration which has been described as the *third* effect of inflammation there.

In those instances, and in those parts in which the effu-
sion of pus is not distinctly bounded and circumscribed by
effused lymph, its effect is naturally to soften the textures
in which it occurs, as is seen especially in the purulent in-
filtration of the lungs, and in the yellow softening of the
brain; sometimes, also, in purulent infiltration into the sub-
cutaneous cellular membrane, or into that which unites the
coats of the intestines. Such changes are generally the effect
of a longer continuance of inflammation, than the softening
or serous infiltration only; but they denote a shorter and
more violent inflammatory action than the chronic indura-
tion of textures by effused lymph, already mentioned. That
both the softening, with infiltration of reddish or brownish
serum, and the softening with infiltration of yellowish or
greenish pus, in nervous matter, are effects of inflamma-
tion, appears most clearly from this, that they may clearly
and speedily result from mechanical injury.

V. The inflammatory effusions, and especially that of pus,
are always attended with more or less of *Absorption*, first
of the serum originally effused, and afterwards of the
lymph which surrounds and limits the suppuration, and of
part of the purulent matter itself. The maturation of a
pustule of small-pox, or other cutaneous suppuration, and
the enlargement of the cavity of an abscess, and its pro-
gress towards the surface of the body (the intervening tex-
tures, and ultimately the skin, disappearing to make way
for it), sufficiently illustrate the amount of absorption
which necessarily attends this effect of inflammation. But
very frequently the absorption, both of the lymph effused,
and of the surrounding textures, that coexists with the ad-
vanced stages of inflammation, takes place in a greater de-
gree, and more irregularly, than is requisite for any useful
purpose, and the process is then said to be attended by Ul-
ceration.

The destruction of the solids of the body by ulceration
takes place with very different rapidity in different tex-
tures, and in different circumstances; and it is always ob-

vious, that the intensity of the preceding inflammation, and the extent of the other effects resulting from it, are by no means the only conditions which determine the degree of the ulceration. It is common on the surface of the body, both in the skin and cellular membrane, and common in the mucous membrane of the alimentary canal,—including the fauces. It is common also in bones, and in cartilages that have had osseous matter morbidly deposited in them by an inflammatory action; in the lungs, and in the inner membrane of arteries; but it is not so clearly the effect of mere inflammation and suppuration in these cases. It takes place, in all parts of the body, more readily in solids recently formed by inflammatory exudation, than in any of the original textures. There are some textures, again, which seldom ulcerate, and often resist and limit the extension of that process; particularly the fibrous texture in all its forms, the serous membranes, and the outer coat of arteries. These peculiarities are often observed, and have important consequences in disease.

The occurrence of ulceration in consequence of inflammation, is very often determined by causes which are sufficiently understood, especially by such as stimulate and irritate parts already inflamed (as is done by the continued contact of any foreign body); and such as enfeeble the circulation, either generally or locally, before and during the excitement of inflammation. There are certain specific kinds of inflammation, to be mentioned afterwards, in which the tendency to ulceration is greater, and more uniform, than in simple inflammation.

As ulceration, consequent on inflammation, is very generally preceded by effusion of plastic lymph, so it is attended by more or less of that effusion which forms the little vascular and organized eminences, called Granulations. When, therefore, inflammation has advanced to this stage, it has established three vital processes, which go on simultaneously, and all of which are new to the part that has become inflamed;—the exudation of plastic lymph, the effusion of pus, and the ulcerative absorption. By the irre-

gular growth of the granulations, and the irregular or vary-
ing extent of the ulcerative absorption, the surface of an
ulcer is necessarily rendered uneven; and ultimately the
healing of the ulcer is effected by the process of exudation
and organization of lymph prevailing over the contrary
process of destruction of solids.

The degree in which these opposite processes shew them-
selves, either over the surface or in any part of the ulcer,
admits of great variety. When the wasting by ulcerative
absorption is most rapid, and there is little or no renova-
tion of solid matter, the ulcer is said to be *phagedenic;*
when the ulceration is attended with partial mortification,
portions of the solid textures separating entire from the
rest, the case is one of *sloughing* ulcer; when the process
goes on slowly, the lymph thrown out at the base and
around the edge of the ulcer becomes hardened, and the
granulations on its surface are deficient, and the ulcer is
said to be *callous,* or indolent; and again, when the granu-
lations are larger and softer than usual, and require to be
repressed, in order that the healing of the sore may be ef-
fected, we have the variety called the *fungous* ulcer. All
these varieties may occur in ulceration following the usual
and simple form of inflammation.

There is a very important difference between the morbid
actions of Suppuration and Ulceration, once fairly esta-
blished, and the morbid action of Inflammation not yet ad-
vanced beyond the earlier effusions of serum and lymph, as
to the degree in which these actions depend on the quantity
of blood that visits the parts affected;—the process of in-
flammation, in its earlier stages, being very certainly re-
strained or arrested by diminution in that quantity; where-
as the loss of blood, although it often prevents the exten-
sion of suppuration and ulceration to parts not yet affected,
is generally found ineffectual in checking the formation of
pus, where that has been already established; and is often,
as may be judged from what has been said as to granula-
tions, unfavourable to the healing of ulcers.

There are a few cases where inflammation, (*e. g.* of the

testis, or of muscular fibres), after it has caused some effusion of lymph, is followed, not by the ulcerative absorption now considered, but by a simple increase of the natural absorption of the part, producing mere wasting.

VI. The termination of inflammation in Gangrene, and then in complete Sphacelus, or in Mortification, is denoted by the part inflamed becoming gradually cold and insensible, and the circulation in it ceasing. This change generally takes place in the parts that had been most inflamed, while the surrounding parts are still in a state of active inflammation. It is usually attended with softness and flaccidity of the affected parts, with a gradual change of colour to purple and then to black, and ultimately with putrescence and a cadaverous smell. But in some cases, chiefly of slow progress, as in the gangrene from the use of diseased grain, the parts affected are hard and dry, and hardly become putrid; and in many cases mortification, especially when partial, is unattended with blackness. Gangrene on the surface of the body often takes place in connexion with serous effusion, and the vesicles formed are then coloured purple or black.

Mortification is observed in consequence of inflammation frequently in the different textures on the surface of the body, and in the mucous membrane of the alimentary canal, occasionally in the serous membrane of the abdomen, and in the substance of the lungs; rarely in other internal organs, excepting in cases of inflammation from injury. Mortification of the bones, either in the partial form termed Exfoliation, or in the more general form called Necrosis, is a common effect of inflammation, especially about the central parts of the long bones; but the whole process is very slow in that texture.

This effect of inflammation is much less uniform, in any texture, than the others, occurring in very various degrees, and at very various periods, from the commencement of the disease, in different cases; and hence there is a manifest presumption that its occurrence is determined by other

conditions in the state of the patient, besides the existence or the intensity of the inflammation. Accordingly, various causes have been observed to increase remarkably the disposition to this effect,—the general tendency of all which may be said to be, to weaken the circulation in the affected part.

Thus inflammation, e. g. that from the irritation of a blister, at a distance from the heart, is more apt to run to gangrene in a feeble habit, than on the chest. The depending position of a part, impeding the action of blood from it; a ligature compressing the veins leading from it, or a fibrous membrane firmly enveloping it, may give the tendency to gangrene from its inflammation; and the same tendency is often observed, if the arteries leading to a part are so injured by disease as to become rigid, and unable to maintain a vigorous circulation through it.

The inflammation excited by a violent stroke or injury, by heat, by cold, by electricity, and by certain poisons (particularly animal poisons), is very apt to go to gangrene, if these causes, at the same time that they excited the inflammation, have had the effect of manifestly weakening the circulation; as in what has been called traumatic gangrene succeeding violent concussions, in severe burns, or frost-bite, in the bites of venomous serpents, and in the effects of some poisoned wounds received in dissection. In like manner, any inflammation, external or internal, which may attend or immediately succeed a contagious febrile disease, where the circulation is much weakened,—typhoid fever, small-pox, scarlatina, or measles, the worst forms of erysipelas or dysentery, the yellow-fever, or the plague,—is more apt than other inflammations to run to gangrene. The same is true of inflammation on the surface of the body co-existing with dropsy or with palsy, when the circulation there is feeble.

Inflammation affecting the stomach and intestines has more tendency to gangrene than in any other internal part; and this co-exists with the peculiar depression of the circulation, which characterizes the fever attending inflammation of these parts.

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In some instances, the tendency to this termination of inflammation would seem to depend on no other cause than unusual intensity of the inflammation, as in the case of the Egyptian or gonorrhœal ophthalmia, tending to sloughing of the cornea, or of unusually violent syphilitic inflammation of the genitals; but it is seldom that extensive gangrene can be referred to this cause only.

When Gangrene has commenced in any part, it must be expected to extend somewhat, and sometimes it spreads very rapidly, especially when the body is under the influence of a powerful cause of weakness or depression. But in more favourable cases, a line is gradually formed along or around the parts in the state of gangrene, which feels hard, and is in a state of adhesive inflammation. At this line there is an effusion, first of serum, then of pus, and ulceration is established, by which a fissure is formed between the living and dead parts, and the latter are loosened and detached. Thus the adhesive inflammation, followed by suppuration and ulceration, sets bounds to the extension of gangrene. The adhesive inflammation extends to the vessels of the part, which are closed by lymph effused from their coats at the point of separation of the living matter from the dead; and it is to this circumstance, rather than to the coagulation of the blood which stagnates in the vessels, that we must ascribe the frequent separation of large sloughs, without hæmorrhage from the divided arteries.

When Inflammation affects the internal parts of the body, and the changes consequent on it are concealed from view, it is of great importance to ascertain the time, when the different effects now considered have already resulted from it, and become so important as to demand the chief attention of the practitioner. This period, of course, cannot be accurately defined, because some of the effects of inflammation commence almost from the beginning of the diseased action; and the activity of the inflammation is by no means necessarily at an end after its effects have become . obvious and considerable; but it is always possible and im-

portant to mark the transition from that stage of any inflammatory disease, where the symptoms of the inflammatory action itself are the most prominent, to that stage where the most urgent symptoms depend on effects already produced by the inflammation, and, for the time at least, irremediable.

If there has been a well-marked attack of inflammatory disease, and it has proceeded, unchecked by any adequate treatment, for a few days, it may always be presumed, that its effects have already become of such amount, as to embarrass materially the functions of the parts affected, even if the inflammation were itself at an end. And the most general indication that can be observed in inflammatory diseases, of their having advanced to this stage, is the continuance or increase of those symptoms which denote derangement of the functions of the parts, after the febrile action of the circulating system has become enfeebled, or undergone a material change.

Thus, in the case of inflammation within the Cranium, if the delirium, or tendency to coma, continue and increase after the pulse has become slow or irregular, and the skin cool, there is much probability of effusion of serum having already taken place, whether with or without other disorganization.

In the case of inflammation of the Air-passages, or the substance or covering of the Lungs, if the affection of the breathing thence resulting continues or increases, while the pulse becomes somewhat feebler, and the heat of skin is somewhat lowered, then it may be a general presumption, that the state of the breathing depends more on the effects of inflammation already produced, than on inflammatory action itself. But more precise information may in this case be very often obtained.

When there is any considerable inflammatory effusion between the Pleura pulmonalis and costalis, on one side of the chest, the most characteristic effects are, that the expansion of all that side of the chest in inspiration becomes imperfect, and there is in general difficulty of lying on the

other side,—that the sound produced by percussion of it becomes dull,—and the respiratory murmur in it becomes faint or inaudible. When a large portion of the substance of one Lung becomes condensed by inflammation, the same changes are observed, but take place more gradually, and the two last less completely ; and besides, in this case the expectoration is more copious, and becomes viscid, generally stained with blood, and ultimately often puriform. When inflammation within the chest is confined to the mucous membrane of the Bronchiæ, the expectoration is often still more copious, but its changes take place more slowly, and it is hardly ever stained so completely with blood ; the natural respiratory murmur is obscured by the râles produced by the thickening of the membrane, and increased effusion of mucus upon it ; and the indications above stated of effusion exterior to the lungs, or condensation of their substance, are wanting.

When either the external covering, or internal lining, of the Heart has been inflamed, if the general febrile symptoms either decline, or undergo a manifest change, by increase of debility, while the action of the heart continues preternaturally strong, and is felt farther over the chest than natural, or its sounds altered from the natural condition,—the presumption is, that there is already either inflammatory effusion on the surface of the heart, or that change on some of the valves, or lining membrane of the aorta, of which the essential characters are, increased thickness, rigidity, and corrugation. And in either case the alteration of structure effected in the heart, and consequent impediment to its functions, soon becomes obvious, by the perceptible enlargement of its size, produced by its preternatural distention and irritation.

Again, when either the external or internal coat of the Intestines has been inflamed, in the different forms of enteritis and dysentery,—the recurrence of vomiting, especially if its character change, and approach to ileus,—the continuance of constipation, especially if attended with increased flatulent distention of the abdomen,—or the con-

version of dysenteric symptoms into intractable diarrhœa,
—while the strength of the heart's action, and the heat of
the surface, undergo a manifest abatement,—generally in-
dicate that inflammatory effusion on the serous coat, or
ulceration on the mucous coat, has already taken place, and
will necessarily continue for a time to derange the func-
tions of the bowels; although in this case the degree of dan-
ger that may exist is not strictly dependent on that de-
rangement of function.

There are some instances, where more sudden and strik-
ing alterations of the local symptoms consequent on inflam-
mation take place, and indicate with almost absolute cer-
tainty certain consequences of ulceration.

Of this the following are the most striking examples.

1. A sudden attack of Pleurisy, succeeding the symp-
toms of ulceration of the Lung, and followed by indications,
both of fluid effusion, and of air, collecting in the side of
the chest,—i. e. by the sound of fluctuation heard on agita-
tion of the body, the modification of stethoscopic sounds
called the tintement metallique, and the dull sound on per-
cussion in part of the side of the chest, the clear sound in
another part, and the absence of respiratory murmur in both.
This denotes, that an ulcer in the lungs has perforated the
pleura, allowed the escape of air into the cavity of the
chest, and excited pleurisy with pneumo-thorax.

2. A similar state of the symptoms in one side of the
chest, and a sudden expectoration of pus, succeeding to
the symptoms, not of ulcerated lung, but of Pleurisy and
pleuritic effusion, in that side; and implying that ulcera-
tion has begun on the surface of the lung, where there has
been previously inflammation and effused lymph, and pene-
trated inwards to the bronchiæ.

3. The discharge of purulent matter by expectoration,
by vomiting, or by stool, after the symptoms exciting sus-
picion of inflammation and suppuration of the Liver,—im-
plying, that suppuration of the liver, and adhesion to neigh-
bouring parts, have been followed by ulceration, and escape
of the effused pus, through the parts that have adhered.

4. The symptoms of violent and acute Peritonitis suddenly supervening on the indications (often obscure) of more chronic inflammation and its effects in the mucous membrane of the stomach or intestines ; which implies, that the coats of the alimentary canal have been somewhere perforated by ulceration, and its contents effused into the cavity of the abdomen.

Farther, the alteration which takes place after a time on the symptoms of the general Fever, accompanying internal inflammation in its advanced stages, is often to a certain degree characteristic of the kind of effect that has resulted from the inflammation.

In particular, the commencement of Suppuration is often marked by rigors, and irregular febrile attacks, which soon pass into the state of Hectic Fever, more or less distinctly defined ; and when this is established, it continues during the processes of suppuration and ulceration, and is marked by the evening exacerbations (sometimes two exacerbations daily) and morning sweats, followed by abatement, without solution of the fever,—by a slight degree only of the thirst, anorexia, or other affections of the organic functions, usual in fevers,—by the absence of delirium, or other derangement of the functions of the nervous system, until the very last stage,—by the long continuance of the disease, and progressive emaciation and debility,—and generally towards the end of fatal cases by diarrhœa, with florid and often aphthous tongue and throat, which is usually found on dissection to have been connected with ulceration in the mucous membrane, chiefly of the small intestines.

This state of hectic fever is by no means distinctly marked in every case where extensive suppuration and ulceration succeed to inflammation ; but in young persons, of irritable constitutions, it may generally be observed. It is often established in such constitutions, by long continued diseased actions, which, although generally combined with or succeeding to inflammation, are not to be considered as simply its effects, particularly the growth and progress of tubercles, afterwards to be considered. In a few cases it is

produced by causes acting on the system for a length of time, but not exciting inflammation in it, as by diabetes, or long-continued nursing. But it attends long-continued suppuration and ulceration so frequently, as to be an important indication of their existence.

There is no form or modification of the constitutional fever, which necessarily attends, or can be regarded as the effect, of the termination in Gangrene. In some instances this effect of inflammation is seen, while the fever retains the strictly inflammatory character. More generally the pulse has become feeble, the surface cold, generally damp, and the countenance collapsed, before gangrene takes place; —or else, the form of fever preceding this effect of inflammation is, in all respects, that described as typhoid. But these peculiarities of the febrile symptoms are not to be regarded as the effects of the gangrene, but the effects of other causes (generally debilitating causes) acting on the body, which at once modify the general fever, and give this tendency to the local inflammation.

It is always to be remembered, that after the consequences of inflammation, now considered, have taken place, there are still provisions of nature, by which their injurious effects are very often averted, and many recoveries effected. The serum thrown out by inflammation is in general readily reabsorbed; much of the lymph that exudes on membranes, or into cellular texture in a healthy constitution, is gradually absorbed also. Either in this way, or else by being converted into pus and expelled by the bronchiæ, it seems certain that much of the solid matter deposited in the cells of the lungs by inflammation may be removed. After suppuration has taken place in any part, absorption of the fluid effused, though a slower and more difficult process, is still occasionally effected, both in external and internal parts; more generally, when pus has been formed in any part of the body, and is confined in the usual way by lymph, it swells outwards where there is least resistance, and makes its way either towards the surface of

the body, or towards some adjoining cavity, where it may be discharged; its pressure, in the direction where there is least resistance, causing progressive absorption of the intervening textures, while the less degree of pressure on the surrounding parts determines adhesive inflammation only, and effusion of lymph, which prevents its being diffused laterally with injurious effect; as is well exemplified in the progress of abscesses in the liver towards the surface of the body, or towards the interior of the lungs, stomach, or bowels.

After ulceration has taken place, and after part of the inflamed textures has mortified, the processes of sloughing, granulation, and cicatrization, are still adequate, in many instances, to the restoration of the healthy condition, especially of external parts. And there is no reason to doubt, that every texture of the body which is susceptible of inflammation, is susceptible also of these healing processes, by which the injurious effects of inflammation are obviated; although in many individual cases the injury done by the inflammation may be fatal, before the provisions for recovery have time to take effect.

An abatement of the violence of the inflammatory action (as denoted by the chief local symptoms), seems always essential to these healing processes; most generally this abatement of the local inflammation is attended by a corresponding decline of the general fever; but in young and irritable constitutions, the febrile symptoms once excited may continue for a short time, after the local inflammation has almost entirely subsided.

It is very important to bear in mind, in concluding this view of the effects of inflammation, how great a variety of diseased actions, disturbance of functions, alterations of the forms and qualities of parts, destruction of parts, and again, praeternatural growth of parts, may be distinctly traced to this first and most important alteration of vital action, which is excitable at pleasure by physical irritation; because this information may be applied, in a certain degree, to the explanation of the still more varied and more obscure forms of morbid action, to be afterwards considered.

SECTION III.

OF THE REMOTE CAUSES OF INFLAMMATION.

AFTER what has been already said of the causes of disease in general, it is unneeessary to enlarge at any length on this part of the subjeet, but it is necessary to state which of the causes formerly enumerated have a peculiar or specific effect in producing inflammation.

Inflammation is hardly ever direetly excited merely by muscular exertion, by external heat (unless in such intensity as to be a loeal irritant), by mental emotion, by such intemperance in eating or drinking as hurries the movement of the blood, or by such evacuations, or such suppression of previous evacuations, as alter the quantity, or even the composition of the blood, although it is often aggravated or renewed by sueh causes. But it is excited by mechanical or chemical irritation (including Heat) applied to the part itself which inflames; and it is excited by Cold, applied generally, or to parts distant from those that inflame, by certain poisons, and by certain contagions, which are believed to be taken into the blood, and to visit all parts of the system, but affect in this manner only certain textures, chiefly the skin, the mueous membranes, and certain glands. And there is always ground for inferring the action of some peeuliar or speeial cause, if any other but an inflammatory disease is produced by these means.

In the natural actions of the intestinal canal, especially when exeited, and in its relations to the containing parts, there are special causes for certain accidents, often acting as eauses of fatal inflammation there, viz. Hernia and Intussuseeption.

There is a class of causes which may be said to act on the footing of loeal irritants in exciting inflammation, but whieh are applied, not to the parts that become actually inflamed, but to others in their immediate neighbourhood, or

peculiarly connected with them.   Thus various local chro-
nic diseases, a carious tooth, a diseased vertebra, or joint,
a strictured urethra, very generally excite repeated attacks
of inflammation and suppuration in the adjoining soft tex-
tures. And injuries of certain nerves excite inflammation in
the parts which they supply.   Of this the best examples
are in the effects and section of the 5th and 8th nerve, on
the eye and lungs; and a conjectural explanation of this
fact was already offered *.

It is always to be remembered, however, that there are
many cases of inflammation for which no adequate excit-
ing cause can be detected.

The tendency to inflammation is not in general given by
Plethora (although the gouty inflammation occurs almost
solely in plethoric habits), nor by habitual excitement of
the vascular system.   On the contrary, there are none who
resist the influence of the exciting causes of inflammation
so well, as those in whom the blood is abundant and the
vascular system vigorous.   But the tendency to inflam-
mation is remarkably given by all permanent causes of De-
bility,—by imperfect nourishment, impure air, long con-
tinued heat, or cold, excessive exertions, excessive evacua-
tions, intemperance, and mental depression.   Of the num-
bers who fall into disease under the influence of these causes,
a very large proportion are always found to have contracted
different forms of inflammation.

The *seat* of the inflammation, which may be produced by
the concurrence of any causes which do not act as local ir-
ritants, is determined in many cases by some assignable
circumstances of predisposition, affecting particular organs,
which were formerly mentioned,—by various causes of lo-
cal plethora or increased action,—by heat acting on the liver
and bowels, or cold acting on the air-passages; by any
causes exciting the secretions of individual secreting or-
gans more than of others, as of the stomach and bowels
during digestion, or of the breasts during lactation; by

* See Physiology, p. 115.

organic diseases confining or obstructing the circulation in particular organs or textures; by previous inflammation facilitating local congestion or inflammation in the same parts as had formerly suffered.

Lastly, the *kind* of inflammation excited on any occasion in the body is very often determined, either by predisposing causes previously acting on the body, or by a specific property in the exciting cause. Thus there is a hereditary tendency, often much increased by full living, which disposes to Gout, in circumstances where otherwise a different inflammatory disease might have been excited; there is also a hereditary tendency, often aggravated by imperfect nourishment, by inadequate protection from cold, and by residence in vitiated air, which disposes to Scrofulous affections, rather than to other forms of inflammation; there is a peculiarity of habit, often resulting from habitual intemperance, which seems to predispose remarkably to chronic inflammation, and to slow effusion of solid lymph and induration of textures. The influence of these causes on the character of the inflammation which may be excited after their application, is of great practical importance, and the evidence of it will therefore be stated afterwards.

Again, the kind of inflammation which is excited by heat acting on the surface of the body is specifically different from that which is excited there by bruises or wounds. And the inflammation excited by each of the contagious poisons, by gonorrhœa or syphilis, by smallpox, measles, or scarlatina, erysipelas, plague, &c., has always something peculiar and *specific* in its own course, and in the nature and progress of the accompanying fever.

SECTION IV.

OF THE PROXIMATE CAUSE OF INFLAMMATION, AND OF ITS LOCAL CONSEQUENCES.

UNDER this head are usually included in medical writings, all observations and speculations in regard to the intimate nature of the changes on which the phenomena of inflammation depend, and the explanation thus afforded of these phenomena.

As all explanations of any physical phenomena consist in reference to general laws, which are exemplified in other and more familiar cases, and as the alterations of vital action, excited by the action of external causes, are a set of phenomena quite peculiar, and hardly to be compared with any others in nature, we cannot expect to go far in the explanation of the facts, of which the history of inflammation consists; it must be expected that all such inquiries will terminate in the determination of ultimate facts, peculiar to this department of nature; and these can be no long series of causes and effects connecting these ultimate facts with the phenomena, of which the explanation is sought. Nevertheless, the rationale of this diseased action, so far as it can be traced, is a perfectly legitimate subject of scientific inquiry, and the results will ultimately be so far satisfactory, and may probably be useful.

There is, in the first place, a preliminary question, which we cannot answer with confidence, as to the share which the Nervous System has in exciting Inflammation;—whether all the remote causes act on the vessels, and their contents, through the nerves of the part, or whether they act directly on the moving fibres and fluids.

It has been supposed by many, that all external causes, which affect the movements of the living body, act through the intervention of nerves; and the causes of inflamma-

tion among others. But the question cannot be satisfacto-
rily disposed of in this summary way; we formerly found,
that the supposition of stimuli acting on all moving parts
exclusively through nerves, is gratuitous and even im-
probable; and farther, it is by no means ascertained, that
the first and most essential of the changes in inflamed
parts, consist in, or bear any close relation to, contractions
of moving parts.

Nevertheless, several considerations prove, that in some
instances at least, the nerves of parts are the instruments
through which inflammation in these parts is excited.

If it were certain that the inflammations of certain or-
gans, especially of the eye, the lungs, and the stomach, for-
merly stated to be consequent on cutting their nerves, were
the direct effects of that section only, these inflammations
might be properly adduced in proof of what is now said.
But it has been already remarked, that the impaired sensibi-
lity of the parts in question, and the consequently deficient
secretion of the mucus, by which they are naturally protect-
ed from the irritation of foreign matters, are probably suf-
ficient to explain these inflammations; as well as the inflam-
mations of the same parts observed in cases of extreme in-
anition, or of disease where there is long-continued debili-
ty and deficient sensibility.

Those causes, however, which excite inflammation in
parts distant from the points to which they are applied,
such as external Cold exciting internal inflammation, may
be reasonably supposed to affect these parts by effect-
ing changes in their nerves; because we know, that sen-
sations and other mental acts, produced by causes acting
on distant parts, powerfully affect the vital actions in the
small capillary vessels of many organs of the body, and
cause great variations in the quantity of blood which they
contain, and in the quantity of secretions which they fur-
nish; and we have good reason to believe, that these effects
(bearing a close analogy to inflammation) are produced
through the intervention of nerves, and especially of the

nerves that accompany the small arteries, and which have generally passed through ganglia.

In a case (not unfrequently observed) of sympathetic sensations of nerves, becoming attended with inflammation of the parts sympathetically affected, as in the shoulder from liver disease, or in the integuments at the knee from disease of the hip, we have still clearer evidence of the possible excitation of inflammation in this way. Nor is it any objection to this doctrine, that the parts which take on inflammation are in some instances neither provided with visible nerves, nor distinctly sensible in the healthy state; because it is hardly possible to be certain of the non-existence of nervous matter in any texture; and also, because we have already seen reason to believe, that an influence derived from nerves may extend to some distance from nerves themselves, and especially may affect the blood which is moving in the bloodvessels.

If it be allowed, that some inflammations may be excited through nerves, a presumption may thence be thought to arise, that even those causes of inflammation which are applied directly to the parts that inflame, affect the vessels through the medium of the nervous filaments; but there is certainly no positive evidence of this. And the fact of all the changes which constitute and succeed inflammation, taking place in an organ of which the sensitive nerves have been cut, and the sensibility extinguished, almost unequivocally shews, that if an influence of nerves be necessary for the commencement, it is not necessary for the subsequent progress of inflammation.

Before proceeding farther, it is necessary to state the general results of microscopical observations, made chiefly on the changes that take place in the vessels of the translucent parts of animals, where inflammation has been artificially excited. It appears, from these observations, that the following changes are observed.

1. An acceleration of the movement of the blood in the vessels of the part, sometimes attended with a distinct

though slight constriction of these vessels; but more gene-
rally, at least soon after its commencement, attended with
dilatation of the vessels, gradually extending itself from the
part first affected. In this accelerated state of the circula-
tion, the blood passes into the small veins less changed
than usual from its arterial state.

2. Within a short time, this state of the circulation, in
the part chiefly affected, gives way to retarded movement
in the dilated vessels, and ultimately to complete stagna-
tion in some of these.

3. The blood, in all the neighbouring capillaries, appears
to incline, sometimes even backwards, towards the part
chiefly affected; these neighbouring capillaries are distend-
ed, and many new vessels shew themselves, whether
brought into view by the red globules traversing them, or
actually formed in the process, is not fairly ascertained. In
the capillaries somewhat farther removed from the point
most affected, the motion of the blood is generally observed
to be accelerated, while there is slow motion, or even stag-
nation at that point.

4. As the blood stagnates in the vessels of the most in-
flamed part, it gradually concretes into irregular masses, in
which the distinction of the globules is no longer percep-
tible. These changes are seen to go on, in animals dying
while inflammation exists, even after all movement of blood
in other capillaries has ceased *.

5. The serous effusion, and afterwards the effusions of
lymph and pus from the inflamed vessels, take place chiefly
while the movement of the blood is slower than usual. The
texture surrounding the inflamed vessels is enlarged. When
there is complete stagnation, the part is much softened, and
approaches to the state of gangrene.

6. If the inflammation subsides without sloughing, the
blood in the part most affected is gradually set in motion
again, its globules reappear, and the capillaries containing
it gradually contract to their former dimensions.

* KALKBRUNNER in MAGENDIE's Journal, 1828.

7. After the first serous effusion from the inflamed vessels, the fluid that escapes from them becomes partially solid, or at least of gelatinous consistence, immediately on its escape, and is partially tinged of a reddish colour ; and several observers agree, that in this slightly coloured gelatinous effusion, it is possible to recognise globules of the blood, more or less divested of their colouring matter, or adhering to one another *.

8. Another very important observation is, that much of the blood which stagnates within the vessels of the inflamed part appears to undergo the same changes †, as that which escapes from them, the colouring matter separating from the bodies of the globules as these are aggregated together ; and even in those capillaries at some distance from the most inflamed spot, which are distended, and where the blood is only slightly retarded in its course, the separation of the colouring from the colourless part of the globules may be observed ; and this change takes place on the globules passing through the capillaries of an inflamed part, even till the latest period of the inflammation.

9. When the inflammation does not pass beyond the adhesive stage, canals are gradually formed in the lymph effused, which have generally an external covering of red matter, and an interior covering of colourless lymph, (Laennec), and into which some of the capillaries of the inflamed textures soon effuse blood. These cavities in the effused lymph are of larger calibre than the vessels which supply them, but gradually contract and assume the usual appearance of vessels. In a few cases it would appear, that such new vessels have been formed in the interior of coagula of blood formed during life in obstructed blood-vessels ‡.

10. In the more advanced stages of inflammation, the actual conversion of some of the decolorized globules of

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* Gendrin, Hist. Anat. des Inflammations, § 1441.

† Gendrin, § 1457.   Kalkbrunner in Breschet's Repertoire, t. 4.

‡ See Lobstein, Anat. Pathol. § 334.

blood, which adhere closely together, into the larger and yellower globules of pus, which have a free motion on one another, may be traced; and according to GENDRIN, this may be seen to take place in three different situations. 1. In the decolorized lymph that has been already thrown out by inflamed vessels. 2. In the blood itself, if confined by ligatures, in the interior of a vessel, the inner coat of which is irritated and excited to inflammation; the globules of blood next the inflamed part of the vessel first losing their colour, and then gradually passing into the state of pus. 3. Within the capillary vessels of a part where inflammation has already advanced to suppuration; some of the globules not only losing their red colour, but acquiring the size and form of particles of pus, while still confined to these capillaries[*].

Two other observations, on a larger scale, are of great importance in reference to the question of the proximate cause of inflammation. 1. That the arteries leading to an inflamed part pulsate with more apparent force, and if divided project blood farther than in the sound state [†]; and, 2. That a vein leading from an inflamed part discharges in a given time a much greater quantity of blood, than a corresponding vein leading from a sound part [‡]. It is not certain, however, during how much of the progress of inmation these observations hold good.

It is unnecessary to make any statements to prove, that the phenomena of inflammation cannot be explained by any alterations that can be supposed to take place in the mechanical or chemical qualities of the blood, and that they are independent of changes in the action of the heart.

The most general opinion, of late years, has been, that they depend on an alteration in the vital action of the arteries of the inflamed parts. But there is much difficul-

[*] GENDRIN, Hist. des Inflammations, sect. 1443, et seq.

[†] THOMSON on Inflammation, p. 67.

[‡] LAWRENCE's Lectures in Medical Gazette.

ty in forming a precise notion of the kind of alteration in that vital action, which will explain the changes observed in the motion of the blood, and the effusions from the vessels.

The following facts appear strongly to indicate, that there is an actual increase of vital action in the vessels of an inflamed part.

1. The causes which, applied directly to any living part, excite inflammation there, are causes which excite in other instances muscular contraction and vital action in general.

2. In inflamed parts it is undeniable that the vital action of nerves is increased, as indicated by the increased sensibility; and also, that the vital affinities, whereby products are formed from the blood, are both altered and increased, the natural result of the process being either the formation of a new deposit and organized texture, or the establishment of a new secretion from the blood at the part. It seems highly probable, that whatever vital power of contraction resides in the coats of the vessels of an inflamed part, will also be excited to increased action under the influence of known stimuli, and simultaneously with this decided increase in the other vital actions of the part.

3. The immediate effects of inflammation on the contents of the vessels of the part, the exudation first of serum and afterwards of coagulable lymph, are effects which may naturally be expected from increased constriction of the coats of these vessels.

4. Although it may be doubted whether the increased force of the movement of the blood in the vessels leading to an inflamed part, implies actual increase in the contractile power of these vessels, yet it is certain that when the heart comes to participate in the altered condition of living parts, consequent on inflammation, the effect on its action is decided increase.

5. As the causes which excite, or aggravate inflammation, are those which excite vital action in general, and muscular contraction in particular, so the causes which diminish or remove inflammation, are means by which mus-

cular contractions are enfeebled, and other vital actions repressed.

But on the other hand, the following are very strong objections to the opinion, that an increase of the vital contraction of arteries can produce all the changes which are observed in inflammation.

1. No such contraction can be perceived on microscopical examination of the small arteries of an inflamed part, as seems adequate to account, either for the increased quantity of blood sent through these vessels, or for their distention, and the effusions from them. The chief and sometimes the only phenomenon observed in the coats of the vessels of inflamed parts is dilatation, insomuch that the condition of these vessels, essential to inflammation, has been thought by many observers, (as WILSON PHILIP and THOMSON) to be Relaxation; and is called by HUNTER active Dilatation; and by one of the most recent and careful observers, KALKBRUNNER, Inflammatory Erection.

2. It is difficult to understand, how an increase of the only vital power which we have seen reason to ascribe to arteries, viz. Tonicity or Tonic Power of Contraction, can lead to distention of the vessels, and at the same time to an increased flow of blood through them.

This difficulty is in some degree obviated by observing, that the smallest branches into which an artery divides itself probably exert, on the whole, a greater action on the blood, than the trunk of that artery*; and therefore, that if the tonic power of contraction is increased along the whole extent of the artery and its branches, that increased contraction must act as a spasm on the extreme vessels, or obstruction to the flow of blood forward into the veins. But although this enables us to understand how an increase of the vital power of arteries should lead to *congestion* of blood in these arteries, and to their *distention*, yet it does not explain how that increased action should cause the increased *transmission* of blood through them; such as takes place, both during much of the inflamed state, and during

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* See Outlines of Physiology, p. 24.

the time of any occasional increase of the nutrition or se-
cretion of any part of the body.

The real condition, as to the vital property of Tonicity, of
the arteries leading to an inflamed part, has not yet been
determined by experiment. The microscopical observations
seem to indicate, what seems *a priori* probable, that in the
small capillaries, there is at first an increased exercise of
tonic power, and afterwards a diminution of power from
distention, going on, in cases of mortification, to absolute
loss of power.   But at all events, the explanation of the
congestion and distention of vessels, and of the increased
transmission of blood, by any conceivable alteration of the
only vital power of contraction which arteries are known
to possess *, is not only difficult and unsatisfactory, but, in
the case of inflammation, is necessarily incomplete; because
there is here a change in the *Vital Affinities* of the part, and
in the nature of the products formed from the blood in it,—
such as no change in the mechanical powers moving the
blood can explain. The ordinary vital affinities of the part,
as shewn by the products usually formed from the blood in
it, are lessened or suspended; the blood in the part under-
goes a decided change, the particles of its fibrin aggrega-
ting together more closely than usual, while its colouring
matter separates from these †; more solid matter escapes
from the vessels than either in health or in other cases of
disease. This solid matter is possessed of peculiar vital
properties, enabling it to become organized; and, after a
time, a new secretion is established at the part. All these
changes vary in the different kinds of inflammation, and in
the inflammation of different textures; and it is by these
circumstances that we distinguish inflammation from cases
of occasional increased determination of blood to a part,

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* See Physiology, p. 28.

. † The strong aggregation of the particles of lymph thrown out by in-
flammation is well shewn, as Mr HUNTER observes, in the case of inflam-
mation of the inner coat of a bloodvessel, where the lymph that exudes,
instead of mixing with the blood, concretes on, and " furs over the lining
membrane of the vessel."

where there is no change of its vital affinities, and therefore no new product formed from the blood.

Now, it appeared from facts formerly stated, that the natural vital affinities of all parts and textures, are a part of the cause of the movement of the blood through them ; and if so, it is natural to infer, that so great changes in the vital affinities, and consequent chemical actions taking place in a living texture,—involving a greatly increased vital attraction of some particles to others,—must be an adequate cause for much of the alteration of the movement of the blood, seen in inflammation.

It appears highly probable, therefore, that the primary and fundamental change in inflammation is not in the vital contractions of vessels, but in the vital affinities subsisting between the component parts of the blood, and between them and the surrounding textures ; and that any alterations that take place in the capacity or vital action of the arteries are consequent on that fundamental change at their extremities, just as the excitement of the action of the heart is consequent on the altered condition of the vessels.]

According to this view of the subject, the primary change is not, strictly speaking, in the fluids of the body, as distinguished from the solids, but it is in the *vital affinities*, common to the solids and fluids, and acting chiefly in that part of the system where the solids and fluids are most intimately mixed, and are continually interchanging particles ; —rather than in the *vital contractions*, which are peculiar to the solids, and which are most distinctly seen in parts of the system where the solids and fluids are most distinct from each other.

Two striking and important facts in the history of inflammation may be stated here in confirmation of this opinion.

1. The effect of inflammation, at least on the heart and large arteries, and probably on the greater part of the vessels leading to the part affected, bears no fixed proportion to the amount of the change which is there effected ; being often slight, as in the cases called latent inflammation, when the

inflammatory exudation is very extensive, and *vice versa ;*
which is not what might have been expected on the suppo-
sition, that all consequences of inflammation result simply
from altered contractions of vessels.

2. Inflammation is more apt to extend from one portion
of a membrane to another portion of the same lying conti-
guous to it, but having no vascular connexion with it, than
to parts supplied from the same vessels as itself, but pos-
sessing a different structure. Now, the influence of vital
affinities certainly extends to some distance from the parti-
cles in which they reside ; and we can understand, there-
fore, that any changes in the vital condition of the blood in
a set of capillary vessels, may be communicated to the
blood in adjoining vessels, equally as it certainly is, to that
in the neighbouring capillaries on the same surface ; but it
is difficult to conceive how either increase or diminution of
the contraction of vessels should be communicated to other
vessels not continuous with, nor arising from the same
trunk as, those first affected.

The nature of the change in the vital affinities of an in-
flamed part, cannot at present be farther characterized than
by the increased aggregation of the particles of the fibrin,
and separation from them of the colouring matter ; the in-
creased attraction between the serum and fibrin of the
blood, and the surrounding textures, into which they ex-
ude ; the increased vitality of the fibrin that exudes, shewn
by its readily becoming organized ; and the gradual trans-
formation of part of it, under certain circumstances, into
globules of pus.

The first effect of inflammation, effusion of Serum, is per-
haps sufficiently explained by the known increased propul-
sion of the blood along the arteries of the part, (to whatever
cause or causes that may be owing), at the same time that
there is stagnation in some of the capillaries to which these
lead. That, in certain constitutions, effusion of entire
Blood, in these circumstances, should ensue, is also easily
understood. But it is plain that this merely mechanical
explanation will not suffice in the very frequent cases where

solid Lymph is thrown out rapidly, in much more than the usual proportion to the serum, and without colouring matter; and that this effect of inflammation, therefore, must be referred to the head of alteration of vital affinities, and increase of the efficacy of certain of these.

It would appear from what has been already stated, that it is by a subsequent alteration, or transformation, of globules of the blood which have stagnated, and been partially decolorized, that the globules of Pus are formed; and that this transformation may go on either in the interior of vessels, or in the exudations that have taken place from them. But on what conditions this farther alteration of the blood depends, or how it comes to pass that, in some cases, it begins almost from the beginning of the inflammation, and in other cases hardly takes place in any stage of it, however protracted, we have no satisfactory information.

The knowledge of the formation of pus taking place within the vessels of inflamed parts is, however, important, as it enables us to give at least a probable explanation of several known and important facts.

Thus, it is stated by ANDRAL, that he had in one case found purulent matter mixed with the blood at the heart, where no suppurating surface existed in the body; and many pathologists have found pus in pretty large quantity in the veins leading from a part where extensive suppuration was going on. In some cases, after suppuration there has been a purulent discharge by urine. It has been likewise often observed, that after amputation of a limb, where there had been long-continued and extensive suppuration, inflammation and very rapid deposition of pus have taken place in internal parts; and the connexion of these with the previous suppuration, is illustrated by precisely similar internal affections following inflammation and suppuration of the inner membrane of veins *.

These facts are easily understood, if we suppose that pus is not only thrown out of the vessels of suppurating surfaces, but also formed within these vessels, and therefore

* See ARNOTT in Medico-Chirurgical Transactions, vol. xv.

gradually mixed with the circulating blood; and when so mixed, is determined to certain parts of the system, nearly as we now know that urea, circulating in the blood, is determined to the kidneys; and either finds an outlet at the suppurating surface itself, or, if obstructed there, escapes by some of the exerctories, or is apt to be deposited in some of the most vascular of the internal viscera.

The purulent matter so circulating with the blood is probably an aggravation at least, if not a chief cause, of hectic fever; and one effect, which very often follows long continued suppuration, may perhaps be ascribed to its action, and tend to its discharge, viz. the ulceration of part of the mucous membrane of the bowels, and colliquative diarrhœa.

The formation of pus within the vessels of inflamed parts, and its gradual admixture with the blood, are principles of much importance likewise, as illustrating the frequent extension, or re-appearance, of various kinds of organic disease, such as Tubercles, Melanosis, or Fungus hæmatodes.

The dependence of the process of Ulceration on absorption, co-existent almost always with the effusion of pus, and the fallacy of the old opinion, which ascribed the loss of substance in ulceration to solution of the solids of the body in the pus formed at the time, were fully and satisfactorily illustrated by Mr Hunter; partly by comparing the process with other cases, where from pressure, from inflammation, or in the natural growth of parts, absorption to an equal extent goes on in the body,—and partly by pointing out the numerous instances of disease, in which great effusion of pus takes place without any diminution, or even with increase, of the solid texture yielding it.

That this effect of inflammation should frequently be determined by pressure on inflamed parts, we can easily understand from what we know of the effect of pressure in increasing absorption; which may perhaps be ascribed simply to its impeding the efflux from the small arteries, and favouring the ingress into the small veins of the part.

In like manner, the increased tendency to ulceration which is given by a languid state of the circulation, general or local, may easily be understood; but there are other cases of inflammation, as that from specific poisons, or that of certain textures as compared with others, which tend peculiarly to ulceration,—but where the reason of this tendency is quite obscure.

The putrefaction of parts affected with Gangrene from inflammation, implies both cessation of circulation and loss of vitality in the blood. The mere circumstance of over-distention of the small vessels, may be thought sufficient to explain their loss of power, just as the bladder or the bowels become powerless from distention; but many vessels in a gangrenous part probably lose their power without being more distended than in other cases where they retain it; and the vital contraction of the capillaries does not appear to be an agent of much efficacy. The principle to which this termination of inflammation is commonly referred, is that of increased action being necessarily followed by diminution or exhaustion of vital power; but it is still doubtful how far this principle, deduced chiefly from the observation of voluntary muscular motions, can be ascribed to the involuntary motions, or to those changes which we refer to the head of Vital Affinities.

It is certain, however, that the tendency to this termination of inflammation is given in most cases, by circumstances in the part affected, or in the condition of the patient, which are known to depress all vital action, as may be shewn by referring to the enumeration, formerly given *, of the cases in which this termination is the most frequent.

* P. 416.

SECTION V.

OF THE PROXIMATE CAUSE OF INFLAMMATORY FEVER.

THE same general remarks, on the limits which the nature of the subject imposes, apply to all inquiries into the nature of Fever (of which that symptomatic of inflammation may be regarded as the simplest case) as to those which relate to Inflammation.

Although the febrile symptoms, accompanying even simple inflammation, in some cases appear earlier than the local symptoms, yet the general case is, that they succeed these; and it is so general a fact, that fever succeeds any extensive inflammation, by whatever cause excited, in a healthy constitution, that we cannot hesitate about regarding general fever as the natural effect of inflammation.

Now, it may be conjectured that inflammation may excite general fever in different ways,—either by tainting the Blood, which is afterwards to be diffused over the body; or by causing such change of the vital contractile powers (perhaps such a constricted state) of the vessels, as may extend itself over the whole Vascular System; or else, by making an impression on the Nervous System, whereby the other parts of the circulation may be sympathetically affected.

That the change on the blood, which accompanies inflammation, is not of itself sufficient to explain the fever, appears sufficiently obvious from the fact, that sizy blood exists in some persons, as in pregnancy, without exciting fever; and, again, that, in some cases, inflammation excites fever, without the blood becoming distinctly sizy.

That it is through the intervention of the nervous system, and not by mere extension of an altered mode of action along the vessels, that inflammation excites fever, appears highly probable from the following considerations.

1. This *general* affection of the system, consequent on local disease, which is seated in the capillary vessels, appears to be peculiar to animals, although actions similar to those which take place in the capillary vessels of animals are observed in vegetables, and are there also liable to *local* morbid changes.

2. Fever follows local inflammation, the more quickly and surely in different individuals, as the functions of the nervous system are more easily excited.

3. The febrile affection of the system consequent on inflammation, takes place suddenly, and is general and uniform over the body from the first, as the effects of mental emotions and sensations, and other causes acting through the nervous system are; which is different from what might have been expected, if the febrile action of the system were the effect of a change gradually extending over the vessels from the part inflamed.

4. Symptoms very much akin to those which usher in fever consequent on inflammation, may be excited by causes certainly acting on the nervous system, such as a concussion, or violent and overpowering sensation or emotion.

5. The degree and kind of fever, consequent on inflammation of different parts of the body, are observed to vary, according as the rest of the system is more or less apt to sympathize with these parts; *i. e.* (agreeably to the account of sympathies formerly given) according as the sensations, excitable by impressions made on these parts, are apt to influence other parts of the body *. Now, the sensations of these parts undoubtedly act only through the intervention of the nervous system, and hence arises a strong presumption, that it is through the nervous system also that inflammations in different parts excite general fever.

We shall afterwards see that there are other reasons for thinking that fever, when unconnected with inflammation, commences by a change in the nervous system; and if so, we have another ground for the presumption, that inflammatory fever also is excited in this way. We judge the

* See JAMES on Inflammation.

immediate cause of the alteration of vascular action in inflammatory fever to be, therefore, an impression on the Nervous System, consequent on the local inflammation, and acting on the organs of circulation in a manner somewhat analogous to a concussion, or a violent sensation or emotion.

Next, as to the nature of the change, produced in the vascular system at large, which constitutes the first step in the febrile action, the most essential part of that change was designated, by Dr CULLEN, by the phrase Spasm of the Extreme Vessels, because there is clear evidence, that during the febrile state the natural secretions from the capillary vessels take place more sparingly and imperfectly than during health. Although the circulation is as much accelerated as by violent exercise, the skin is dry, or any sweats that take place are transient, and ineffectual in reducing the temperature ; the clammy tongue, thirst, impaired appetite and digestion, and usually costive bowels, denote deficiency of the various secretions of the *primæ viæ*; the quantity of urine is less than the usual proportion to the liquid ingesta would make it, and its colour and saline impregnation proportionally greater than usual; any morbid secretions, such as ulcers, are diminished or suspended, and nutrition appears at a stand, while absorption goes on.

These phenomena, succeeding to a state of constriction and coldness of the surface of the body, and attending an increased frequency, and often strength, of the heart's action, evidently indicate that the natural and healthy relation between the strength of the heart's action, and the amount of vital actions in the capillaries over the body, is materially altered ; and if we supposed, as CULLEN did, that contraction of the heart, and of the different orders of vessels, are the only causes by which the amount of secretions and exertions is determined,—we should admit, that the supposition of spasm in the extreme vessels, confining the circulation to the larger of the vessels that terminate in veins, is at least highly probable. But we have seen reason to believe, that the amount of secretions and

excretions is very much influenced by other causes, besides the contractions of any living solids; and therefore, instead of speaking of *spasm of the extreme vessels*, we use the expression *deficient vital action in the extreme vessels*, as more accurately indicating what we know to be the fact, as to the state of the functions that go on there, as compared with the excited condition of the heart, in fever. And it seems probable, that the chief cause of this deficiency of vital action is a *torpor of the vital affinities*, rather than any alteration of the vital power of the vessels.

We have seen, that there are powers acting in the extreme vessels, which *dilate* and *expand* the artéries leading to the parts where they are exerted,—such powers as act in the uterus during pregnancy, and in the breasts during lactation, and which appear to consist in increase of the affinities by which the solids or fluids of the body attract their appropriate pabulum from the blood. When these powers are diminished, (as they certainly may be by causes acting through the Nervous System) the effect must be the same as if the tonicity, or contractile tendency, of the smallest capillaries were increased; the flow of blood through them will be diminished, and proportionally more of the blood will be returned by the largest of the branches that communicate with the veins.

It is to be observed, that an excited condition of the heart's action is always followed by some diminution of secretions, as we see in the effect of exercise; but this diminution of secretions is more partial than in fever, and is unattended with the diminution of voluntary muscular power; and besides, the indications of deficient vital action in the capillaries in fever, evidently *precedes* any decided increase of the frequency and strength of the pulse, and therefore appears to be the cause, not the effect, of the Febrile Reaction.

Now, in whatever way it may happen that the vital actions in the capillaries are impaired in fever,—the mere circumstance of their being impaired, implies that the motion of the blood through them will be limited and imperfect; the flow of blood in the capillary vessels of the greater

circulation will be obstructed, somewhat in like manner
as the flow in the capillaries of the lesser circulation is ob-
structed, when the exposure of the blood to the air at the
lungs is in any way impeded; and the quantity of blood that
returns to the heart by the largest of the vessels that open
into the veins, will be proportionally increased; and this
state of things at the extremities of the circulation is cer-
tainly, as HOFFMAN and CULLEN taught, an adequate cause
for the affection of the heart in fever.

The effect of *temporary* torpor of the vital actions in the
capillaries, obstructing the free motion of the blood there,
and thereby leading to temporary excitement of the heart,
is illustrated by the fact, that *permanent* obstruction to the
free flow of blood from the heart, in cases where the large
arteries are rigid and inert from disease, leads to permanent
excitement, and thereby to increased bulk and strength, or
hypertrophy of the heart.

That the obstructed flow of blood in the capillaries, and
accelerated return by the veins, is the cause of the excited
condition of the heart in fever, appears farther from the ef-
fect of bloodletting in the cold stage, (especially of Inter-
mittent Fever, where the successive stages are the best
marked) which has been repeatedly observed to arrest the
progress of the existing paroxysm.

The increased energy given to the heart's actions by
muscular exercise, accelerating the motion of venous blood
towards it, appears to be analogous to that which is given
to it in the beginning of fever, when the blood, not diver-
ging so readily as before into the smallest capillaries, is
returned more rapidly to the heart.

There is no difficulty in understanding, how an increas-
ed action of the heart, thus produced by, and co-existing
with, deficient vital action in the capillaries, should pro-
duce the chief symptoms of the hot stage of fever, such as
heat of skin, flushing, headach, thirst, &c.

In thus attempting to trace the mode in which local in-
flammation appears to excite general fever, there is no oc-
casion to refer to what has been called the Vis Naturæ

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Medicatrix, and indeed all reference to that supposed agent amounts to nothing more than a statement of the final cause, or ultimate result, of the changes ascribed to it,—which, however important as evidence of design, and of the moral government of the world,—is of no avail in simply tracing the sequence of physical causes and effects.

Neither is there any ground for thinking, as CULLEN did, that the increased action of the heart has ultimately the effect of resolving the diseased condition of the capillary arteries, and is thus the chief agent in removing the disease; for the abatement of the morbid condition of the capillaries generally takes place at a time when the action of the heart has already become weaker, and is often remarkably promoted by the use of means which rapidly and decidedly enfeeble that action.

In fact, the fever that is symptomatic of inflammation, although it changes its character materially, does not altogether subside, until the morbid actions consequent on the inflammation have ceased; and for the cessation of these, in a case left to Nature, we can assign no other reason than the essentially temporary nature of the diseased state in which they originate.

There is no difficulty in understanding how it should happen, that in some cases already mentioned, especially the case of inflammation of the abdomen, and of inflammation preceded by a violent injury and concussion, the reaction in the inflammatory fever should be deficient; and the whole febrile symptoms remarkably modified by that circumstance; because these are cases, in which the effect of the inflammation is combined with the agency of a cause which evidently depresses, and when it acts in the highest degree extinguishes, the vital power of the heart,—as has been sufficiently illustrated when we treated of the depressing or even fatal effect of various injuries, or rapid diseases, of the abdomen, and of the effect of those injuries of the whole body which are fatal by concussion.

A somewhat similar form of inflammatory fever, with feeble or deficient reaction, may be observed in the case of

inflammation excited by the introduction of a poison into any part of the system, and also in the case of inflammation affecting a vein, and leading to the formation of pus, which mixes with the blood, and may probably act as a poison; and in these cases likewise it is obvious that the heart's actions are affected by another cause besides the existence of a local inflammation.

SECTION VI.

OF THE MODES OF FATAL TERMINATION OF INFLAMMATORY DISEASES.

In order that the Pathology of this or any other diseased state may be satisfactory, and susceptible of practical application, it is evidently necessary that we should understand, not only the changes that take place in the organs affected, and the way in which they are effected, but also, the manner in which these influence the actions of the system at large, and ultimately extinguish life. It is by the knowledge and anticipation, in individual cases, of the particular kinds of fatal termination to be apprehended from them, that rational and scientific practice in inflammatory diseases must necessarily be regulated; and fortunately we have more accurate information on this subject, by reference to the simpler cases of violent death, already considered, than we have as to the nature of the inflammatory action itself.

It is to be observed, however, that none of the fatal terminations of inflammation are inevitable; when the effects which lead to them have already commenced, there are still provisions of nature by which all of them may be arrested; it is by the degree, not by the mere existence of these effects, that the fatal event is always determined.

I. Inflammation is sometimes quickly fatal, independently of any alteration in the texture of the inflamed part, simply by the gradual depression of the powers of the circula-

tion which attends it, and which may be called a strictly sympathetic effect. The case of inflammation of the Peritoneum is the best example of this danger. This inflammation is sometimes fatal (especially if it has occurred in consequence of a perforating ulcer of the intestine and effusion of feculent matter) without even effusion of lymph on the inflamed surface. When effects of this inflammation, perceptible on dissection, are found, they bear no fixed proportion to the intensity or rapidity of the symptoms; and in all cases of this kind, the disorganization which is found, effusion of serum, of lymph, or of pus, thickening of the membrane, even gangrene of the membrane (which is more rarely found), although they may explain torpor of the intestines, afford no explanation of the gradual but rapid depression and ultimate extinction of the heart's action, and consequent coldness of the surface; otherwise than by reference to the principle already explained *, that any violent injury of the abdomen, by virtue probably of the intense and peculiar sensation it excites, acts as a powerful sedative on the heart.

There is very great variety as to the length of time, after inflammation of this texture has commenced, before this sympathetic influence on the heart becomes manifest,—as to the rapidity with which it advances,—as to the extent and degree of inflammatory effusions that go along with it, —and as to the period within which it may be fatal. Even when the consequences of inflammation, found on dissection, are the same,—effusion of pus and of soft lymph,— the duration of the disease may have varied from thirty-six hours to several weeks, and for this variety we cannot assign with confidence any cause but peculiarity of constitution. But it is in this manner almost exclusively that inflammation of this part produces death, and it affords the best example of death beginning at the heart, and uncomplicated with simultaneous affection of the brain, which occurs in any disease.

Inflammation of the Mucous Membrane of the bowels,

* See p. 333.

producing the symptoms of dysentery, is sometimes, though rarely, fatal in its first stage, when the only effect visible on dissection is effusion of lymph, taking somewhat of a tuberculated form, on this membrane. In such cases, death is produced just in the same way as in the cases of peritonitis now mentioned. More generally, inflammation of the mucous membrane of the bowels goes to ulceration long before it is fatal, but it is almost always attended with more or less of the sedative effect on the circulation, which is so strikingly exemplified in these rapid cases; and this is apparently the reason of dysentery having been ranked with putrid, rather than inflammatory diseases, by the older pathologists.

Inflammations of the kidneys, bladder, uterus, and larger joints, may be fatal on the same principle, without any such visible effect resulting from them, as can impair the functions of the organs essential to life, and before there is time for any exhausting process of suppuration or ulceration to be established. And although inflammation of the liver generally leads to decided disorganization before it is fatal, yet the change effected on that organ is often inadequate to explain the cause of the symptoms, and the fatal event, otherwise than on the same principle.

II. Inflammation is sometimes fatal by reason of the Serous Effusions consequent on it, impeding and obstructing the functions of parts essential to life. This may happen especially in three situations. 1. When inflammation of the brain, marked by the symptoms of phrenitis or acute hydrocephalus, leads to such effusion into the ventricles of the brain as causes fatal Coma. 2. When inflammation of the mucous membrane of the larynx produces œdema of the glottis, and consequent Strangulation. 3. In the rare case, where inflammation, attacking both lungs at once, is fatal in its earliest stage, before any other consequence than serous effusion into the cells of the lungs has taken place, but that so generally as to disqualify the lungs for their function, and cause death by Asphyxia.

In all these cases there is a difficulty in assigning inflammation as the cause of death where nothing but serous effusion is found on dissection; nor are we justified in doing so, merely from the appearances in the dead body. In merely chronic cases, great effusion into these parts may take place independently of inflammation; and in the case of effusion within the cranium, not only when the sutures yield and the head is gradually enlarged, but when there is no such enlargement, we know, that the greatest accumulations of serum, and distention of the ventricles, are exceedingly slow in their progress; and are unattended, at least during most of their progress, with inflammatory symptoms during life, or any decisive indications of inflammation after death.

It is therefore always by a comparison of the serous effusion, found in the parts above mentioned after death, with the causes, duration, and progress of the symptoms before death, that we judge such effusions to be inflammatory. When we find, *e. g.* such effusion into the ventricles of the brain, as, if taking place within a few days, must necessarily imply much pressure on the brain, and explain a fatal coma equally as effused blood or depressed bone does,—preceded by violent symptoms of a few days duration,—and these symptoms just the same as are seen in other cases, where, on dissection, not only serum, but pus and lymph are found effused on the brain,—we cannot hesitate about regarding the serous effusion also as a result of inflammatory action. And in fact, in many of the cases to be mentioned under the next head, where lymph or pus are effused into the brain, air-passages, or lungs, the fatal coma or asphyxia cannot be ascribed to them alone, but must be held to be in part the effect of the concomitant effusion of serum.

III. In many cases, inflammation within the Head or Chest, has such distinct and unequivocal effects as satisfactorily explain death by Coma or by Asphyxia.

1. The formation of circumscribed abscesses containing pus within the substance of the brain,—the " ramollissement

rouge," or softening with serous and bloody infiltration, the "ramollissement jaune," or softening with purulent infiltration of that substance, and the effusion of an extensive layer of soft lymph or of pus, on either surface of the pia mater, whether attended with serous effusion into the ventricles or not, are held to be sufficient to explain not only convulsions, delirium or palsy, but stupor and death. For although it be true, as formerly stated, that these and other injuries of the nervous matter, superior to the medulla oblongata, do not necessarily imply any such consequences; and although the inflammatory action which produces these effects may take place with very various degrees of rapidity, and be attended with a considerable variety of symptoms; yet it is evident that when it does take place rapidly, it must naturally make such an impression on the substance of the brain, and such a change on the circulation there, to some distance from its own seat, as may effectually disqualify it for its function. And it is known by sufficient experience, that when the general symptoms of inflammation, and the particular symptoms of derangement of the functions of the brain, have occurred with violence, and advanced rapidly to coma and death, these appearances, and these only, have often been found on dissection.

In some cases of partial softening of the substance of the brain, the condition to which the affected part is reduced approaches to sphacelus; and in some instances of this kind effusion of blood into these disorganized portions takes place, which will naturally account for rapid acceleration of the fatal coma *.

In other instances, where effused blood and surrounding softening of the brain are found, the progress of the symptoms gives us reason to believe, that the effusion of blood by rupture of vessels is the first change.

Induration of portions of the brain from inflammation is sometimes likewise the chief cause, which appears on dissection for fatal coma; but the progress of such cases is generally so slow, that they are to be regarded rather as on the footing of organic diseases connected with alteration

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* See ANDRAL, Precis. &c. t. ii. p. 764.

of the nutrition of these parts, than as the results of inflam
mation simply.

2. When the Pericardium is inflamed, there often re-
sults such an effusion of serum loaded with flakes of lymph,
or of soft but concrete lymph almost without serum, or sub-
sequently of purulent matter, as necessarily impedes and
alters, and, within a time admitting of great variety (from
forty-eight hours to several weeks), finally suppresses
the action of the heart. But as, in such cases, the func-
tions of other parts, and especially of the lungs, naturally
suffer likewise, the death from this cause seldom takes place
so distinctly and simply in the way of Syncope, as in other
cases of inflammatory diseases already noticed, where the
affection of the heart is truly sympathetic.

3. When the mucous membrane of the Larynx and Tra-
chea is severely inflamed, there is always reason to appre-
hend rapidly fatal Asphyxia, either from an effusion of lymph
forming a preternatural membrane, obstructing the glottis,
and sometimes stretching down to the bronchiæ (which
occurs chiefly, though not exclusively, in young children),
or from effusion of pus behind the membrane about the
glottis, or even from mere inflammatory thickening of the
membrane (with or without the serous infiltration already
noticed) at that, which is the narrowest part of the air-
passages.

It is important to be aware, that death may occur with
similar indications, by strangulation rather than suffoca-
tion, in consequence of effusion of pus into the cellular sub-
stance surrounding the pharynx, causing pressure on the
rima glottidis.

4. When the lining membrane of the Bronchiæ is inflam-
ed, an increased secretion of mucus, often changing gra-
dually to the puriform appearance, necessarily results ; and
although this may go to a great extent and last very long
without danger, yet it becomes certainly dangerous, and may
even cause rapidly fatal asphyxia, by the obstruction it
gives to the access of the air to the blood, in two cases,—
first, when it occurs in a feeble habit,—as in the very old,

or the very young, or in the course of weakening diseases, when expectoration is difficult and imperfect; and *secondly*, when it occurs (as seldom happens in idiopathic cases) generally in both lungs, and extends every where to the minute branches of the bronchiæ *.

5. When the substance of the Lungs is extensively inflamed, the effusion into the air-cells of lymph, more or less coloured by the red matter of the blood, and tending more or less rapidly to conversion into purulent matter, must be expected to cause such impediment to the arterialization of the blood, as to threaten death by asphyxia within a few days.

6. When the Pleura is inflamed pretty generally on one side of the chest, it often happens that the fluid effused into its sac, and which gradually assumes the character of pus, becomes so abundant as to compress the lung of that side to such a degree (although with very various rapidity), as to disqualify it for its function, and threaten death by asphyxia.

In both these last cases there is a difficulty as to the reference of death to the inflammatory effusion compressing or obliterating the cellular structure of the lungs, from the observation of the great variety in the amount of effusion found after death in different individual cases; the portion of the lungs left fit for their functions being in some cases much smaller than in others,—whereas the danger from this cause might, on first consideration of the subject, seem to be just in proportion to the amount of obstruction of the air-cells.

But this difficulty is removed if we attend to the following considerations, *first*, that in cases where the whole quantity of blood in the body is less than usual, there is less occasion for a large amount of healthy lung to arterialize this blood, than when the full quantity of blood circulates in the vessels; *secondly*, that when a portion of lung is *gradually* rendered unfit for its office, the blood of the pulmonary artery, as injections demonstrate, is gradually diverted from the dis-

* See LAENNEC, Traité de l'Auscultation, &c. t. i. p. 203.

eased portion, and directed to the healthy parts *; *thirdly*, that in many cases the effects of peripneumony and pleurisy, now in question, are combined, either with each other, or with the other causes of asphyxia already mentioned.

Indeed, several of the different causes of the fatal termination of inflammatory disease of which we now treat, are often and very variously combined in different individual cases.

IV. There are cases in which inflammation is fatal, apparently by reason of some part of the effusions to which it gives rise, being mixed with the blood, and acting on the footing of a poison. Thus, when inflammation is excited in a spot on the surface, by the application of a specific Poison, as by a wound in dissection, it is speedily attended by the formation, probably of a similar poison, which is evidently absorbed, and excites fresh inflammation in the line of its passage into the mass of the blood; but this inflammation is attended by a peculiar *typhoid* fever, in which the heart's action is rapidly depressed, which bears no fixed proportion to the extent or intensity of the inflammation itself, and by which death takes place without visible injury of any vital organ; sometimes before the inflammation has advanced beyond its first stage †, and generally long before it has gone so far as in the more usual inflammations of the same parts.

Again, in the case of inflammation of the lining membrane of a Vein, the accompanying fever soon takes a similar typhoid form, often with vomiting and purging, always with a feeble or depressed state of the heart's action, as well as with derangement of the nervous system. In many such cases, this typhoid form of the fever, rather than any effect which we can ascribe to the inflammation itself, appears to lead to the fatal termination; in like manner, as a similar combination of typhoid symptoms does, when occurring idiopathically, or as a part of a malignant contagious febrile

* See SCHRÆDER VAN DER KOLK, Observations Anat. Pathol. p. 66.
† See TRAVERS on Constitutional Irritation.

disease; and this peculiarity of inflammation of this part has been ascribed to the necessary admixture of much of the inflammatory effusion with the circulating blood, with more probability than to any other cause.

V. In many cases, the fatal termination of inflammatory diseases cannot be ascribed to any mechanical or even vital agency of products of the local disease, but is effected by gradual exhaustion of the vital powers during the processes of Suppuration, and of Ulceration or Sloughing. In such cases, death takes place rather by syncope than by coma or asphyxia; but often after so slow a process as to resemble more the death by fasting than that by concussion, or by any injury directly depressing the heart's action. The febrile symptoms attending suppuration and ulceration have usually the form of hectic; those which attend gangrene are more rapid in their progress, and more typhoid in their character; but it has been already observed, that these last are very generally to be ascribed, in part, to some other cause, acting simultaneously with the inflammation, and depressing the vital powers.

It is by the gradual exhaustion consequent on the concomitant fever, rather than by local changes, that inflammation of the surface of the body, of the extremities, and organs of locomotion, is dangerous or fatal; and the danger attending inflammation and suppuration of some internal viscera, as the liver, spleen, kidneys, and mucous membranes of the intestines, is generally of the same slow gradual kind.

VI. Inflammation often leads, more indirectly, to a fatal termination, by gradually passing into, or blending itself with, other modes of diseased action, which demand future consideration, and aggravating the danger to which they may respectively give rise. Local inflammations of certain parts, and of a peculiar character, very often attend both idiopathic fever and febrile exanthemata, and constitute great part of the danger of these diseases; and it is gene-

rally allowed that inflammatory action sometimes gives
origin to, and often combines itself with, almost all the
chronic diseases to which the living body is subject at va-
rious periods of their progress, and especially with those
which imply the greatest danger, viz. those which consist
in perversion of the nutrition, and increase of the exhala-
tions of various textures, or what are usually called Orga-
nic Diseases, and Dropsies; and the combination is fre-
quently fatal, where either affection existing separately
might subside, or pass into a more inert or less dangerous
form. This kind of danger is, of course, to be apprehended
chiefly when the causes of inflammation are applied, either
simultaneously with those of other diseases, or to persons
in whom chronic diseases, or a strong predisposition to
them, already exist.

As we know that the products of unequivocal inflamma-
tion admit of considerable variety, and that lymph, ef-
fused by inflammation, may subsequently undergo conver-
sion into various kinds of substance, it is evident that any
kind of adventitious texture that may be formed in the
body may originate in inflammatory action, and that it is
possible for inflammation to give rise to every kind of or-
ganic disease. But on the other hand, as we know that
the lymph which is thrown out by simple and healthy in-
flammation remains for an indefinite time quite inert, and
undergoes gradual absorption, after that inflammation has
subsided, it is clear that some additional morbific cause
acts, whenever inflammatory effusions change their form,
and especially when they increase in bulk, after that period;
and many observations shew that, where such morbific
cause exists, very little inflammatory action is required to
give origin or continuance to the growth of adventitious tex-
tures, and the phenomena of organic disease.

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SECTION VII.

OF THE VARIETIES OF INFLAMMATION.

ALTHOUGH there are many variations in the progress of inflammation, in different instances, which cannot be reduced to any general heads; yet it is also ascertained that there are varieties which admit of being classified and generalized, and the causes of which can be assigned; and these are of such importance as to demand a separate consideration.

I. After the statements already made, it is unnecessary to dwell on differences among inflammations which are dependent on the *texture affected; i. e.* differences in inflammations proceeding from the same cause, especially from cold, and affecting different textures.

It is sufficient to observe, that inflammation in cellular substance, and in the parenchymatous viscera, is generally attended with less intense fever, and with less pain (unless the inflamed parts are so situated that their distention is prevented), than that in serous membranes, and that it is generally more limited in extent, and tends more surely to the formation of circumscribed abscesses;—that the inflammation of the true skin is rapid in its progress, and tends especially to effusion of serum betwixt it and the cuticle, *i. e.* to vesication, as is seen in blistering, and in the effect of burns, or of mechanical pressure, affecting this texture only;—that the acute inflammation of serous membranes is that which spreads the most rapidly, and excites the most pain and fever, tending first to the effusion of serum and lymph, and less certainly to that of pus, and in all parts of the body, inflammation of these membranes possesses these general characters;—that inflammation of the mucous membranes varies more in different parts of the body, but, in general, is attended with less pain or fever, spreads less

rapidly and extensively, and tends first and chiefly to in- crease and alteration of their own secretions; in some parts also, especially in the stomach and intestines, to ulceration.

Again, inflammation of the investing membrane of bones, and other fibrous membranes and cartilages, has, in general, less tendency to effusion of pus than in many other parts; it is slower in its progress, and tends especially to effusion of solid lymph, often afterwards undergoing conversion into bone, and to various alterations of the nutrition of the bones, to which many of these membranes are attached. Inflammation of bones themselves, and of cartilages, has also peculiar characters, particularly in the tendency to the formation of fresh bone, on the one hand, and to ulceration or sloughing (*i. e.* caries and necrosis), on the other.

When rheumatic inflammation (which has certain speci- fic peculiarities not at present in our view), attacks diffe- rent textures, it is obvious that the results to which it leads are determined by the nature of these textures,—the syno- vial membranes pouring out fluid effusion only, the sheaths of the tendons, and the pericardium, if it be affected, often acquiring a lining of solid lymph, the bones acquiring an increase of solid matter, by which they are enlarged and distorted, and the muscular fibres undergoing no decided change but that of loss of substance and of power; this last is indeed a texture, from the nutrient vessels of which inflammatory effusions perhaps never take place.

II. There are varieties in the degree of intensity and ra- pidity of progress of inflammations in all parts of the body, which cannot be strictly defined, but are expressed by the terms Acute, Subacute, and Chronic. It is right to distin- guish the second as well as the third of these varieties from ac- tive and intense inflammation, because there are cases which are rapid in their progress, sometimes even pretty extensive, · but never attain any great intensity, nor require very power- ful remedies to control them. Many such occur in various parts of the body, sometimes idiopathically, sometimes in com- bination, either with acute febrile disease (idiopathic Fever

or Exanthemata), or with chronic disease, functional or organic; and have had the epithet Subacute applied to them with more propriety than Chronic.

The term Chronic is properly applied to those inflammations which tend to the same consequences, and, in many instances, infer the same danger as the acute, but run their course much more slowly, and generally with less urgent symptoms. It seems necessary to make a deduction from cases which have been described as of this kind, because many such had not been seen by the describers at the commencement of the inflammatory symptoms, and may therefore have been cases of effects, or sequelæ of acute inflammation inadequately treated, rather than examples of chronic inflammation. It is proper also to exclude, at present, from chronic inflammations, cases where adventitious textures are found, distinct from the ordinary products of inflammation, although there be much difficulty in distinguishing these forms of disease by their symptoms. But setting aside all such ambiguous cases, there remain a large number, where the usual results of inflammation, especially effusion of grey or yellowish lymph, and consequent induration of textures, or effusion of pus (e. g. into the sac of the pleura) has certainly taken place slowly and gradually, and often with symptoms, obvious indeed and decided, but chronic rather than acute,—the local affection being for a long time more obvious than the constitutional, and the latter consisting more in debility and emaciation than in febrile action.

Such Chronic Inflammations are chiefly seen in debilitated habits, but it were a fatal error to suppose that such subjects are not likewise very liable to attacks of acute inflammation. It may perhaps be stated as a general fact, that on membranes chronic inflammation leads more to effusion of pus, and in the interior of viscera more to thickening and induration.

III. There is a well marked and important difference between the form of inflammation called Phlegmonous and

that called Erythematic, in external parts. The Erythematic Inflammation is characterized, 1. By its tendency to spread along the surface of the body, often subsiding at one part as it extends to another ; 2. By its colour, which is of a less vivid red than other external inflammations, and by its producing vesication of the surface, but little or no effusion of solid lymph ; 3. By the form of the accompanying fever,—which in different cases bears no proportion to, and does not appear to be dependent on, the extent or intensity of the inflammation,—generally commencing in severe cases, to which the name Erysipelas is given, one, two, or even three days, before the inflammation shews itself,—being sometimes dangerous or fatal when the inflammation is slight,—and very often shewing, throughout its course, more prostration of strength, more tendency to delirium or stupor, more dryness of tongué, and evidence of diminished secretion over the body, *i. e.* a more typhoid form, than the fever that is simply symptomatic of inflammation does.

In all these respects, this form of inflammation may be said to be *specific.* It differs from that which may be excited, at pleasure, by mechanical or chemical irritation of the surface of the body, although it often supervenes in injuries so excited. The body here appears to be under the influence of a cause, which produces both a peculiar inflammation, and a peculiar kind of febrile action ; and the case is therefore justly held to bear as much analogy to the febrile exanthematous diseases, to be afterwards considered, as to the inflammations.

Accordingly, although the danger in this form of inflammation sometimes depends merely on the extent of the local changes, and is to be obviated by moderating or repressing these, yet it sometimes depends obviously on the typhoid form, and especially on the depressing influence of the constitutional fever, and cannot be inferred from observation of the local inflammation, nor be averted by remedies applied to that part of the disease.

So decided a deviation from the more usual form of in-

flammation of the surface of the body, may be suspected to depend on a local and temporary cause, rather than on causes of general operation; but the conditions necessary to the existence or effect of this cause have not been fully ascertained. The Erysipelas has been observed to prevail most in confined and ill-aired situations, and to occur most commonly in persons in whom the digestive organs are disordered, or the general health otherwise impaired, but it certainly cannot be referred simply to any of these circumstances as its cause. At certain times and places it prevails much more extensively than at others; and at these it is well ascertained that it is sometimes propagated by contagion, or in a few instances by inoculation.

The term Phlegmonous is applied chiefly to that inflammation of external parts which ends in the formation of circumscribed abscesses formed by dense lymph; but it may be applied to any external inflammation which does not produce vesication, nor spread rapidly along the surface.

The Erythematic Inflammation is certainly not peculiar to the skin. In many cases it is seen to affect the mucous membrane of the nose, mouth, fauces and larynx, simultaneously with the skin of the face and neck, and to preserve its appropriate characters in these situations. In some instances it affects the fibrous membranes, especially the pericranium. It very often affects the cellular texture, immediately beneath the portions of skin which it occupies, and produces effects similar to what it does on the surface, effusion first of bloody serum, and then of pus which is in general imperfectly, or not at all bounded by effused lymph. And it is well ascertained, particularly by the inquiries of the late Dr DUNCAN, that this diffuse inflammation of the cellular membrane not only extends in many cases beneath the skin, and among the muscles, to a distance from the affected parts of the skin, but likewise occurs independently of any affection of the skin,—that it may arise from many causes, but especially from the introduction of a poison into the system,—that it sometimes prevails almost epidemically along with the Erysipelas;—

and that it is attended, like it, with fever of extremely various intensity, and often of strictly typhoid character.

Again, there is good evidence, that at least in one of the internal serous membranes, viz. the peritoneum, inflammation occasionally presents very nearly the same characters as Erysipelas on the skin, tending to effusion of bloody serum, of a whitish milky fluid, or of more perfect pus, with little or no exudation of plastic lymph; that such cases are in general remarkably rapid in their progress, and that the depression of the circulation attending them takes place early, and is hardly to be counteracted by antiphlogistic remedies *.

When Peritonitis succeeding parturition prevails epidemically, and evidently spreads by contagion, under the name of Puerperal Fever, the inflammation is in like manner attended, in most cases, with little exudation of plastic lymph; and the danger of the disease, in the worst epidemics of that kind, is so little dependent on the extent or intensity of the inflammation, that the most rapidly fatal cases are those in which the least inflammatory appearance is found on dissection. Such epidemic Peritonitis has also been observed to be connected with unusual frequency of Erysipelas.

IV. Besides the Erythematic, there are various other forms of inflammation affecting the skin, which are easily distinguished from the inflammation that is excitable at pleasure by irritation, from the erythematic above described, and from each other.

Although the different orders of cutaneous diseases which are distinguished from one another according to the nature of the products, which appear in the skin, in consequence of an inflammatory action there, are combined, or hardly to be distinguished, in many individual cases; yet there are other examples, where these distinctions are easily observed, throughout the whole of the affections. Even setting aside, at present, the contagious Ex-

* See ABERCROMBIE's Pathological Researches on Diseases of the Stomach, Intestinal Canal, &c. 2d edition, p. 197.

anthemata, there are many cases, *e. g.* of pretty intense inflammation of the skin, which lead to no effusion whatever, and are merely followed by desquamation (Exanthemata of WILLAN), yet are easily distinguished from the simple Erythema. There are many distinct examples of inflammation leading merely to effusion of serum between the cutis vera and cuticle (*vesicles* when they are small, *bullæ* when large),—of inflammation leading to purulent effusion there (*pustules*),—of inflammation leading to little elevations of the cuticle, without fluid (*papulæ*),—or to larger elevations, with partial suppuration only (*tubercles*), —and of inflammation leading to the formation of dry scales only (*squamæ*). All these run a peculiar course, with various rapidity, undergoing various changes, and often admitting of very little abbreviation by art. In many of them the sensations are also peculiar, smarting heat or itching, rather than pain; and they may all be called Specific Inflammations.

Again, when inflammation is seated chiefly in the subcutaneous cellular membrane, it often shows those peculiarities to which the term Carbuncle, instead of simple Phlegmon, has been applied; in which the effusion of pus takes place into many small cavities lined by lymph, instead of one larger cavity,—there is afterwards sloughing of much of the affected part of the membrane,—the progress of the changes is slow, and the constitutional symptoms often typhoid.

There is no reason to think that inflammations of internal parts take place in equally numerous and definite varieties; but the Aphthæ, or whitish crusts often occurring in children idiopathically, and in adults in the course of different weakening diseases, on the mucous membrane of the mouth and fauces, are an example, similar to most of the cutaneous diseases, of slight inflammation followed by peculiar and long-continued effects; and there is one form of inflammation of the mucous membrane of the fauces, almost equally well defined as any of the cutaneous affections above mentioned, and sometimes prevailing almost epidemically, —that to which the term " Diphtherite" has been applied

by BRETONNEAU and others, of which the chief characters
are, the rapid formation of flocculent aphthous crusts, of-
ten extending into the larynx, and sometimes down the
œsophagus, with little intensity of previous inflammation,
and with fever, slight in the commencement, and afterwards
generally typhoid.

Whether there is any thing equally peculiar or specific,
in the exudation, and subsequent ulceration, on the mucous
membrane of the intestines, which often takes place in the
course of continued fever (and has been called Dothin en-
terite), or in that which characterizes Dysentery, is not so
clearly ascertained.

V. There are three distinct varieties of Inflammation,
strictly called Specific, each of which affects a variety of
textures,—the Rheumatic, the Gouty, and the Syphilitic.

The distinctive characters of the Rheumatic Inflamma-
tion may be stated to be, 1. That it affects different parts,
and, in general, even different textures, within a short time,
viz. certain fibrous membranes, probably muscular fibres,
synovial membranes, often portions of the bones, and
sometimes certain internal membranes, especially the peri-
cardium, and membrane lining the interior of the heart.
2. That it shifts from one to another of these more rapidly,
and more frequently, than any other inflammation does,
insomuch that its rapid recession at one part of the body is
rather a reason for expecting its appearance in another,
than any security against its farther progress. 3. That,
when existing alone, it never leads to suppuration nor ul-
ceration, but to serous effusion into the articular cavities,
to thickening and induration of fibrous membranes, and
remarkably to effusion of solid lymph on the surface of the
pericardium, or on the internal membrane of the heart,
when these are affected. From these peculiarities, it may
be suspected that there is something peculiar in the state
of the blood in Rheumatic Inflammation; and it has been
generally observed, that the fibrin of the blood, in violent

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eases of Acute Rheumatism, is very abundant, and its se-
paration from the colouring matter very complete.

The Gouty Inflammation, which affects the same textures
as the Articular Rheumatism, differs from it chiefly, 1. In
affecting a much smaller number of joints in one paroxysm,
and these generally the smaller joints of the extremities.
2. In being very generally preceded by disorders of the
stomach, and when it recedes suddenly, being as generally
followed by violent affection of the stomach, sometimes in-
flammatory, often apparently neuralgic. 3. In being one
of the diseases to which a portion of mankind only is in
any circumstances liable, and in its occurrence being very
often traced to hereditary predisposition, and very much
dependent on a state of plethora, and especially on the use
of fermented liquors. 4. When it lasts long, in leading to
the effusion of the peculiar matter called Chalkstones, which
consists chiefly of uric acid.

From this last fact, and from the frequent connexion of
gout with gravelly deposits in the urine, it is pretty ob-
vious that one condition necessary to the establishment of
this kind of inflammation is, a morbid matter circulating
in the blood; but the origin of this matter is much more
doubtful.

All that need be stated here as to the Syphilitic Inflam-
mation, a variety undoubtedly depending on a peculiar mor-
bid matter applied to the surface, and then circulating in
the blood, is what follows.

1. It affects peculiarly the skin of the genital organs, the
lymphatic glands in their neighbourhood, the mucous mem-
brane of the fauces, the skin generally, the iris of the eye,
and the periosteum and bones, at the parts where these are
densest.

2. It is every where of a chronic character, and tends to
peculiar consequences—in the lymphatic glands, to sup-
puration and then ulceration; in the skin, to various, but
perhaps most frequently to scaly exudations, and often
subsequently to ulceration; in the iris, to simple effusion
of lymph; in the skin of the genitals and of the fauces,

very certainly to ulceration (which ulceration, in the best marked and most severe cases, is characterized by the deep excavation and hardened base) ; in the bones, to irregular deposition, and concomitant absorption, constituting Caries.

It may be added, that the Syphilitic Inflammation and Ulceration are peculiarly under the influence, in most cases, of Mercury acting specifically upon them ; but it certainly cannot be maintained, as was formerly done, that any form of syphilitic ulceration is absolutely devoid of the disposition to heal, where mercury is not used.

It is very important to bear in mind, that syphilitic inflammation is often combined with, or passes into the form of, simple acute inflammation of the same parts, and often also, it appears to be combined with scrofulous inflammation. Independently of such combinations, there are many varieties in the appearance and progress of the affections resulting from impure sexual intercourse, such as those designated by the names pseudo-syphilis, syphiloid disease, phagedenic, pustular, vesicular, or tubercular venereal disease ; but whether these varieties are to be ascribed to different specific poisons acting on the body, or to peculiarities of constitution, is still doubtful.

The poison of Gonorrhœa acts as a cause of specific inflammation in the mucous membrane of the urethra and tunica conjunctiva of the eye, which is characterized by rapid extension along the membrane, by copious effusion, which soon becomes puriform and capable of propagating the disease, and by great thickening of the membrane, but, on the former part at least, by total absence of tendency to ulceration.

The action of Mercury on the body is a specific cause of inflammation in the salivary glands,—of inflammation, aphthous exudation, and superficial ulceration in the mucous membrane of the mouth and fauces,—and in certain persons, of a peculiar vesicular eruption on the skin. It seems also to be a frequent cause of aggravation of inflammation, whether simple, scrofulous, or in some instances even syphilitic, in various parts of the body ; but it can hardly

be said to act *per se* as a sufficient cause of inflammation
in other situations than those mentioned.

VI. The form of Inflammation which is termed Scro-
fulous demands a somewhat more detailed notice.

" The term Scrofula is used by medical writers in two
senses ; *first*, to express the existence of a disease which
possesses certain distinctive characters in whatever part it
may be seated, *secondly*, to indicate a disposition, diathesis,
or state, which *predisposes* some part of the body or other
to become affected with such disease *."

Scrofulous disease is most generally and distinctly charac-
terized, either by a peculiar variety or modification of in-
flammation, and of suppuration and ulceration consequent
thereon, easily enough recognised when the affection is
seated externally; or else, by the formation and subsequent
changes of those tumours, or adventitious textures, in vari-
ous parts of the body, which are called Scrofulous Tuber-
cles. The connexion which exists between the scrofulous
inflammation and the deposition and growth of these tuber-
cles, will be considered presently.

There are some kinds of disorganization or organic dis-
ease, distinct from either of the kinds of diseased action
also mentioned, to which the term Scrofulous is likewise
commonly and correctly applied, but which generally co-
exist with indications either of the scrofulous inflamma-
tion, or of the scrofulous tubercles.

The term Scrofulous Diathesis is applied to that pecu-
liarity of general habit, which appears to furnish the great
predisposition to these kinds of diseased action, it being
well ascertained that it is only a portion of mankind that
under ordinary circumstances of exposure to the causes of
disease become affected in this way.

The marks by which we distinguish the form of Inflam-
mation denominated Scrofulous, are less peculiar and cha-
racteristic, than those which distinguish the erythematic, or
other specific inflammations; but where the whole course

* THOMSON on Inflammation.

of the affection is observed, the distinction from simple or healthy inflammation becomes obvious. The common affection of external lymphatic glands is perhaps the best example. The pain and heat are not great, the colour is often nearly unchanged for a long time, and then is somewhat livid or bluish, the progress is remarkably slow, and is little influenced by remedies. But besides these, which may be said to denote only chronic inflammation, there is a more decided peculiarity in the suppuration, which generally follows such inflammation, lasting longer than in ordinary cases, in the discharge being more serous, but usually mixed with fragments of curdy matter,—in ulceration very generally succeeding, and in the ulcers being indolent, shewing little disposition to heal, and often degenerating into fistulæ.

The following may be stated as the distinctive characters, (known from the examination of many different bodies, in which they exist in different stages of progress), of Scrofulous Tubercles; which, however, admit of considerable variety, both as to the mode of their deposition, and the changes they afterwards undergo.

They are at first very minute, soft, or of nearly gelatinous consistence, of a greyish colour, and of a somewhat opaline lustre, have more or less of the rounded form, and are very often set together in clusters on the membranes, or in the textures, where they are formed, (Tubercules miliaires.)

They afterwards enlarge considerably, several of them generally coalesce into one irregular mass, and they become opaque, yellowish, and of the consistence of soft cheese (tubercules crus). These tubercular masses then frequently soften, first in their centres, and degenerate into a purulent fluid, having more or less the character of scrofulous pus above described, some fragments of the solid tubercular matter floating in the fluid without becoming themselves liquid. But although many tubercular masses are thus converted into ulcers, there are others which gradually harden into cartilaginous, and then into earthy con-

cretions, and remain in an inert state for a very long time. The ulcers shew very little disposition to heal, but when they are not very numerous the discharge from them gradually abates, and they may become small fistulous cavities free from all diseased action.

Appearances of simple inflammation are very often found around these tubercles, many of which may be judged from various circumstances to be posterior to them in date, and may be ascribed in part to the irritation resulting from them.

Although they undergo various changes in the interior of their substance, at various periods after their deposition commences, it does not appear from injections, that tubercles are themselves provided with vessels, and hence they have been called morbid secretions, perhaps more properly than adventitious textures. When the tubercular deposition is far advanced, the vessels of the parts affected are much obstructed, by the disease extending to their coats, the quantity of the blood sent through these parts is much diminished, and the whole circulation in the neighbourhood much altered *.

These appearances are found in very different parts of the body,—according to the observations of Laennec nearly in the following order of frequency. The lungs, the lymphatic glands, the liver, the prostate gland, the mucous membrane of the bowels, the pleura and peritoneum, the testis and its appendages, the spleen, the heart, the uterus, the brain and cerebellum, the bones, and lastly, adventitious or morbid textures, with the peculiar matter of which they are not unfrequently mixed. Of these parts, the lymphatic glands and the highest portions of the lungs are those in which tubercles most frequently originate; and it is important to observe, that these are parts in which the capillary circulation must necessarily be very slow.

When tubercles exist in any part in considerable numbers, they are very generally attended by much debility and emaciation, and, in young persons especially, by frequency of pulse; but the other symptoms connected with

* See Schræder Van der Kolk, Observationes, &c. p. 75 & 85.

them must be expected to vary extremely, according to the organs in which they are formed, or the functions of which they impede,—according to the presence or absence of concomitant inflammation, and according to the changes which they themselves undergo. When they exist in those parts in which they generally suppurate, as in the lungs, and in the intestines and mesenteric glands, they are generally attended with hectic fever ; but this is by no means a general fact. Deposits very similar to incipient tubercles, taking place in the heart, liver, or kidneys, are often fatal, without attaining any great size, or shewing any tendency to suppurate, and without producing any symptoms but what may be distinctly traced to obstruction of the functions of these parts.

The following affections, often seen in connection with scrofulous inflammation, or with tubercles, may be stated as perhaps equally characteristic of the scrofulous habit.

1. The slow phagædenic ulceration of the nares called Lupus.

2. The conversion of the synovial membrane of joints into a brownish pulpy matter, seen in the most distinct cases of White Swelling *.

3. Ulceration of the cartilages of the joints without distinct previous inflammation of the synovial membrane †.

4. The formation of those tumours which have the name of Encephaloid substance, or Fungus Hæmatodes, which may exist in various parts of the body, and which are of softer consistence, are found in larger masses, and grow much more rapidly, than the scrofulous tubercles.

In applying the general term Scrofulous to the different affections now noticed, we do not, of course, mean to assert, that they are essentially of the same nature, although a general resemblance may be traced among them. But we are induced to give this general name to all these affections, in consequence of our knowing by ample experience, 1. That they all occur very frequently in persons in

* See Brodie on Diseases of the Joints.   † Id.

whom certain peculiarities of constitution, independent of actual disease, may be observed. 2. That two or more of them very often succeed one another in the same individual. 3. That they all occur remarkably in different individuals of the same families, while other families are exempt. 4. That they are all induced or aggravated, and again may be confidently believed to be averted or mitigated, by the same or similar causes.

No word would convey the same important meaning, which this term Scrofula does, which should be confined to affections precisely of the same kind; because what we wish to do, in using the term, is to mark the connexion that subsists between different diseased actions, which ap. pear, from their history, to depend on the same peculiarity of constitution, and therefore ultimately on the same general causes, and which may often be prevented or alleviated by the same general measures.

Neither is it meant, in referring these different affections to the Scrofulous habit or Diathesis, as their great predisposing cause,—to assert either that every inflammation in such a habit must be of the scrofulous character, or that none but persons previously of that habit, are susceptible of scrofulous disease. We know that healthy inflammation, shewing no unusual or specific character, may exist in a person already suffering under scrofulous disease; as we see in the healing of many wounds in such persons, and in many cases of occasional or *intercurrent* inflammation, occurring in the course of tubercular diseases. And we know, that in certain circumstances (*e. g.* under the influence of long-continued cold, and deficient nourishment, coupled with long-continued local irritation) scrofulous disease may be excited in constitutions previously quite healthy and robust.

Nevertheless, it is important both to mark the indications, and to generalize, as far as possible, what experience has established as to the cause, of that habit of body, in which the different scrofulous affections are most apt to occur, and most to be dreaded.

The chief mark of the scrofulous habit, in persons not yet affected with any disease, is a certain soft, flaccid habit of body, and especially a remarkable softness of skin, observed in persons in whom such a texture of the skin is not to be expected. The complexion is usually pale, with frequently a clear circumscribed redness in the check; and this colour is easily changed to purple or livid by cold. The eye has often a peculiar pearly lustre. The senses are usually acute, and the mental powers of observation and apprehension peculiarly active, so that children of this habit shew, in general, a precocity of intellect. The scrofulous tendency is perhaps more frequently and decidedly seen in those who have fair or red hair, and blue eyes, than in others; but is common in dark-complexioned persons also.

In many cases it is more decidedly shown by slight diseases, or the effects of injuries, before any serious disease is contracted;—by the enlarged glands in the neck and groins, the tumid upper lip, the chronic inflammation of the alæ nasi and membrane of the nostrils,—the chronic ophthalmia tarsi, or the strumous inflammation of the tunica conjunctiva of the eye, lasting long, with little heat or redness, but much impatience of light, and a peculiar tendency to the formation of small pustules; and also remarkably by the slow healing of slight wounds, the somewhat livid and chronic inflammation, and often the unhealthy suppuration, that succeed them. Those children that have the softness and consequent distortion of the bones, enlarged joints, and other marks of Rickets, are also very frequently, if not necessarily, prone to scrofulous disease.

The following are the principal facts that have been ascertained, as to the causes by which the Scrofulous Diathesis, or liability to scrofulous disease, is produced.

They may all be ranked together as causes of debility, acting permanently, or habitually for a length of time, although not so powerfully as to produce sudden or violent effects.

1. The tendency is decidedly *hereditary*,—*i. e.* those whose

progenitors have shown marks of scrofulous disease, be-
come affected in this way in much larger proportion than
others; although it is very seldom that tubercles, or other
scrofulous affections are *congenital*.   Feebleness of habit in
parents, even independently of actual scrofulous disease in
them, appears evidently to dispose to scrofula in their off-
spring.

2. Although not so exclusively confined to one period of
life, as has been stated by some, scrofulous diseases are
much more frequent in childhood and youth, *i. e.* between
the ages of two or three, and thirty or thirty-five, than at
any subsequent period.

3. Although a diet almost entirely vegetable is often
found sufficient, when other circumstances are favourable,
for the formation of a vigorous habit of body, yet it may be
confidently stated, that *a low diet* habitually taken during
youth and in health, disposes to scrofulous disease more
than a fuller diet does.

4. The scrofulous diathesis is remarkably increased by
the influence of *cold and wet*, acting for a length of time in
the living body; as is shown by the much greater preva-
lence of such diseases in the temperate or cold climates,
than in those where any applications of cold are compara-
tively transient,—and also, by the greater frequency of
such affections in winter, and especially in spring, than in
summer and autumn, in this climate.

It is, however, a mistake to suppose, that the tendency
to scrofulous disease cannot be formed in hot climates. The
long-continued application of heat, in early life, is weak-
ening, and therefore favourable to the formation of the
scrofulous habit; and it is found by experience, that the
natives of those climates, both white and black, are peculi-
arly liable to scrofulous diseases when they come to the
colder climates; from which it obviously follows, that the
rarity of scrofulous disease in the warmer regions of the
globe, is the effect of exemption from its great external
cause,—from cold of sufficient intensity, and more espe-
cially of sufficient endurance;—but that it is not the effect

of absence of the internal predisposition to such disease, in the inhabitants of those regions.

Hence, although it is often of real importance to remove young persons, evidently of scrofulous habit, from a colder to a warmer climate, at the period of life when scrofulous disease is most apt to occur, in order that the excitation of the disease at that period may be avoided; yet it is a mistake to suppose, that this measure furnishes any security against scrofulous disease in future, if they shall return to their native climate, and be there fully exposed to the causes of such disease.

Children brought up in the colder climates, if of healthy constitution, well fed, and duly protected from the excessive or long-continued application of cold, acquire a decidedly stronger habit of body, from the habitual stimulating effect of alternations of temperature formerly considered, than those who are never exposed to such alternations; and therefore resist scrofulous disease (e. g. Phthisis) when the latter would fall into it; and the natives of the colder climates, therefore, while they are more frequently exposed to the external cause of scrofula, have also at their command more effectual means, if duly and cautiously employed, for fortifying the constitution against it.

Perhaps it may also be stated, that the exemption of the inhabitants of hot climates, is rather from the scrofulous diseases of particular organs (especially the external parts and the lungs) than from scrofulous disease in general; for the chronic diseases of the Liver and Bowels, so common in hot climates, approach very nearly, in their first origin, to the distinctly scrofulous affections.

5. The formation of the scrofulous habit is probably more influenced by mode of life, especially in early youth, than either by hereditary taint, or by climate.

It is hardly possible to observe separately the effect on the animal economy, of deficiency of exercise and deficiency of fresh air, these two causes being very generally applied together, and often in connexion with imperfect nourishment. But it is perfectly ascertained, on an exten-

sive scale, in regard to the inhabitants of large and crowded cities, as compared with the rural population of the same climate, *first*, that their mortality is very much greater, especially in early life, and the probability of life very much less (the difference being, in some cases, as 45 or 50 to 5, or even to 3) ; and *secondly*, That of this great early mortality in large towns, a very large proportion, generally a majority of the whole *, is caused by scrofulous disease. And from these two facts, it evidently follows, that deficiency of fresh air and of exercise, are among the most powerful, and the most important, because often the most remediable, of the causes from which the scrofulous diathesis arises.

6. It has also been frequently observed, although the observations have not been on so large a scale, and therefore the conclusion is not so completely established, that the inhabitants of low moist situations are more liable, *cæteris paribus*, to scrofulous disease, than the inhabitants of higher and more airy districts.

7. The tendency to scrofulous disease is remarkably increased by habitual mental languor and depression, as it is counteracted by mental excitement and habitual pleasing emotions †.

8. This tendency is increased by the debility succeeding great evacuations, and especially by that which succeeds acute diseases, as fevers, or the exanthemata, or the febrile state excited by mercury.

9. It is increased by any such causes as habitually impair the digestion, and counteracted by such means as are effectual in restoring the more natural state of the digestive organs, and thereby the general strength.

The effect of all the causes now enumerated is, to give a tendency to inflammation, however excited, to assume the peculiar chronic form above described, and likewise to predispose to the deposition, in various parts of the body, of

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* See a paper on Scrofulous Diseases by the author, in Edinburgh Medico-Chirurgical Transactions, vol. i.

† See a striking example in the inhabitants of a nunnery, living under unusual restraints, stated by LAENNEC, Ausc. Mediat. t. i. p. 647.

the substances described as Scrofulous Tubercles, and which are the origin and foundation of the most formidable scrofulous diseases.

Now, it is obviously of the utmost importance, to ascertain whether, or how far, the deposition of tubercles is itself an effect of inflammatory action. If these deposits can be assimilated to the lymph effused by inflammation, their pathology will be greatly elucidated, and the means of restraining their formation be clearly indicated. And, on the other hand, in so far as we can ascertain that their formation differs from the simple effects of inflammation, we must regard the remedies for inflammation as inadequate or improper in the view of checking that formation.

That the deposition of tubercles may be, and often is, the result of an action, to which it would be absurd to give any other name than Inflammation, appears to be sufficiently demonstrated by the following facts.

1. Their formation may be determined in various instances by the application of the same causes which excite inflammation. This is most unequivocally shewn by experiments on animals, e. g. those of FLOURENS on ducklings and chickens *, which, by being kept in a temperature somewhat less cold and more varied than that which excited acute pneumonic inflammation, were subjected to a disease of the lungs, having the essential characters of scrofulous phthisis; and those of MOULIN, SAUNDERS, CRUVEILHIER, KAY, and others†, in which substances not to be distinguished from scrofulous tubercles, and in some instances running nearly the usual course of these, were formed, in consequence of particular modes of mechanical irritation, as by mercury dropt into the trachea, and acting in small quantities, but permanently, on the minute vessels of the lungs.

When we compare the results of such experiments with the well ascertained facts, that masons, miners, needle-

* Annales des Sciences Naturelles, 1828.

† See CULLEN's First Lines, with Appendix by GREGORY, vol. i. p. 590.

grinders, and other artificers, who are necessarily in the habit of very frequently inhaling irritating particles, are peculiarly liable to scrofulous phthisis, we cannot doubt that this peculiarity is to be ascribed to the habitual mechanical irritation; and it is surely reasonable to infer, that what is so easily excited by mechanical irritation of a living part, in a previously healthy animal, must be a product of inflammation.

Again, there are many instances of strictly scrofulous local disease excited manifestly by more serious local injuries, and in which it appears ultimately that the deposition of tubercles had been the origin of the mischief.

2. Cases occasionally occur, where although the deposition of tubercles does not result from mechanical injury, we are very certain that the symptoms attending their first formation are observed,—especially the cases where this deposition is much more general than usual, and fatal much more quickly, and where they are found in great numbers, and all about the same size, implying simultaneous deposition; and in such cases, the remote causes, symptoms and progress of the disease are very generally found to be just those of inflammation of the same parts, of somewhat slower progress than is usual *.

3. The examination of the morbid parts in cases where we see tubercles in their early stages, often shows scrofulous tubercles not only coexisting with, but graduating by insensible degrees into, usual and acknowledged effects of inflammation,—such as flakes of lymph on membranes, or granulations formed by lymph and effused into cellular texture; and the substance which has the form of incipient tubercles, so precisely similar to that which is thus irregularly diffused, that we cannot ascribe to them a different mode or period of formation. This intimate blending of tubercular deposits with inflammatory effusion, and distinct transition by insensible degrees, of the one into the other, is often seen on the serous membranes of the head,

* See the papers in Edinburgh Medico-Chirurgical Transactions already quoted, vols. i. and iii.

chest, or abdomen, on the mucous membrane of the bowels, and in the interior of the lungs or liver. The tubercular matter in the lungs is often, as LAENNEC states, *infiltrated* into the cellular texture, and when so, it is impossible to draw a distinct line of demarcation between it and the grey hepatization of the lungs.

4. Although the changes which tubercles undergo after they have been deposited, are generally much slower than, and sometimes materially different from, those which take place in decidedly inflammatory effusions, yet in many cases they resemble those changes in their essential characters; and in the case of children, in particular (where their course is always more rapid than in adults), they are sometimes hardly to be distinguished from small abscesses, resulting from the usual causes of inflammation, gradually enlarging, then softening, and ultimately discharging purulent matter.

From these facts, it seems quite reasonable to infer, that in certain constitutions, tubercles and all their consequences are direct effects of inflammatory action, and may be prevented if that action be arrested or subdued.

But on the other hand, it is plain, that there must be an essential peculiarity in the nature of the morbid action by which tubercles are formed, from these two leading facts in their history, which distinguish them from the ordinary effects of inflammation; 1st, That they are originally deposited in very minute but separate globules; and, 2dly, That when deposited, instead of being very liable to absorption (as the lymph effused by healthy inflammation is), they continue to grow, when there is no indication of inflammation around them, and even when the whole quantity of blood supplying the parts where they exist is much diminished. And the history of many cases informs us, that when the constitutional peculiarity leading to such consequences is very strong, little or no inflammatory action is necessary to determine the deposition of tubercles; but that they will be formed wherever there is any congestion of blood, and sometimes where there is no vestige of previous disturbance of the circulation.

This tubercular diathesis may be reasonably supposed to depend, in part at least, on some peculiarity in the condition of the blood ; and it is very important to observe, that it appears to be manifestly increased by tubercular disease already existing in any part of the body ; fresh deposits taking place, often in various parts, more frequently, and with much less evidence of previous disease, in cases where tubercles already exist in numbers in one organ (*e. g.* in the lungs), than in any other cases.

The most leading fact that has been observed, as to the essential nature of tubercular deposits, and their difference from the diffused organizable lymph thrown out by healthy inflammation, is that stated by GENDRIN *, but requiring farther confirmation, that when examined by the microscope in their earliest stages, and in their distinct form, they never shew any of the decolorized globules of the blood, which can be detected in the fibrinous effusions from healthy inflammation.   Hence probably it is, that they do not form layers or flakes, as the latter substance does, in consequence of the peculiar mode of aggregation of the globules into fibres ; but that they gather into little spherical masses, under the influence of gravitation, as any other viscid fluid does, when slowly poured out in thin films, or narrow lines. Hence, also, in all probability, their incapacity of acquiring vascular organization.

All that is known of the conditions under which scrofulous tubercles usually originate, may perhaps be comprised in the proposition, That when the blood is unusually serous, and its motion languid, in numerous small capillaries, partial exudations of its albuminous portion are apt to take place, and cohere together into minute spherical masses, which are destitute of the power of acquiring an organized structure themselves, but grow by attracting to themselves fresh matter from the vessels ; and that this exudation, although not absolutely dependent on, is much promoted by, congestion of blood, or inflammation, in the parts where it takes place.

* Hist. Anat. des Inflammations, t. ii. p. 595.

CHAPTER VII.

OF IDIOPATHIC FEVER.

THE combination and succession of symptoms, which we regard as characteristic of Fever, or febrile action, have been already described; and it has also been stated, that these symptoms, even as occurring in connexion with, and apparently in consequence of, inflammation, are liable to considerable variety, and particularly to two varieties, already designated as *inflammatory* and *typhoid;* of which the latter has this important peculiarity, that it may very generally be ascribed to the influence of some other cause affecting the constitution, besides the inflammation itself. We have now to treat of Fever (almost always more or less of this last character), as it frequently occurs, either without marks of local inflammation, or with so slight or so variable marks of that kind, that we judge it proper to consider it as independent of inflammation.

It is true, that there are eminent pathologists who doubt of the existence of such Idiopathic Fever; believing all febrile action to be dependent on local irritation and inflammation; but we set aside that doctrine in the mean time, simply on the ground, that physicians have generally described fevers, of the kind now in question, as distinguishable by their symptoms and history, independently of all theory, from any of the certain and acknowledged effects of inflammation; and this being so, it is right to treat of the diseased states thus distinguished, in the first instance, separately; and afterwards to consider the *Theory* which would resolve the one into the other. And although the term Idiopathic Fever may appear too theoretical to be used in the first instance, yet it is hardly possible to substitute another; and if it be understood that it is at first used to

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designate peculiarities of symptoms, independently of all theory, it can hardly tend to mislead.

We set aside also, without hesitation, the objection that has been urged against the doctrine of Idiopathic Fever, that the term expresses only an abstraction, and therefore a nonentity ; because what we mean to express by the term is not an *abstract* existence, as distinguished from individual *facts*, but a *general* change, or succession of changes, common to all the organs, and to almost all the textures of the body, as distinguished from such changes as are *partial, i. e.* confined to particular situations in the body,—and from the direct consequences of such partial changes.

SECTION I.

OF THE DIAGNOSTIC SYMPTOMS AND VARIETIES OF
IDIOPATHIC FEVER.

THE peculiarities by which Idiopathic Fevers, according to this acceptation of the term, seem to be best distinguished, are the following.

I. There is the *negative* fact, that in many of the cases, to which this name is given, the general febrile symptoms, —the chilliness and lassitude, the subsequent reaction, and often long-continued acceleration of pulse and heat of skin, the thirst, anorexia, various uneasy sensations, and derangement of all the functions of the body (whether functions of the vascular or nervous system),—are often unattended during great part or the whole of their progress, by any such local symptoms,—such fixed and permanent local uneasy feeling,—or such peculiar derangement of the functions of any one part of the body, as justifies the belief that any individual organ is inflamed. And if these observations be thought ambiguous, on account of the occasional occurrence of cases of latent inflammation, formerly men-

tioned, the absence of local inflammation, in many such cases, is farther attested by the fact, to be afterwards stated, that they sometimes terminate fatally, without any satisfactory evidence appearing, on dissection, of inflammation of any part of the body; and very generally with so slight appearances of that kind, as are inadequate to the explanation of the fatal event.

II. Besides this negative observation, which applies only to a part of the cases thus named, there is the *positive* observation, applicable probably to all cases of idiopathic fever, although much more obvious in regard to some than others, that the *typhoid* symptoms, formerly shortly described, (and which may always be held to imply the action on the system of some cause distinct from mere local inflammation) are distinctly to be perceived. These typhoid symptoms shew themselves in one or other, but generally in several, of the following ways.

1. In the state of the Circulation, the pulse having very generally, from the commencement, or early in the disease, less strength, or resistance to compression, than in the fever which usually accompanies simple and decided inflammation, at the same period after the attack.

2. In the state of the Secretions, which are more deranged, and generally more diminished, than in inflammatory fever; as is sufficiently obvious in the fur on the tongue, and the secretions of the mouth, becoming viscid, dry, and dark-coloured; in the more complete failure of appetite; and generally, after a short time, in the greater dryness of the surface of the body, attended in most cases by a more pungent, though less enduring, heat of the surface.

3. In the state of the Nervous System, the greater tendency to stupor or confusion of thought, generally to be detected even in the commencement, and very obvious in most cases throughout most of the disease, often shewing itself unequivocally in the later stages by the involuntary voiding of the excretions which are naturally under the restraint of the will; the greater weakness, vertigo, and faint-

ness on attempting exertion, in the early part of the disease, attended generally with much tenderness of surface and general soreness; the frequent tremors and subsultus tendinum, even when no exertion is made; the greater derangement of the external senses, particularly of that of Hearing; the greater tendency to delirium, as the disease advances, and the usually peculiar character of that delirium, which extends to all the trains of thought in the mind, is unattended with propensity to violence, and is more or less blended with, or graduates into, stupor, and hence is generally designated by the epithets low, muttering.

4. In the state of the Blood, which is probably always so far altered in its vital properties, in idiopathic fever, as to coagulate less firmly than usual, and in some cases loses the power of coagulation altogether; in connexion with which state we frequently observe more or less of the symptoms formerly called those of putrescency in fever, petechiæ or vibices, passive hæmorrhages, and gangrene from slight irritation.

These symptoms, and especially the indications of nervous affection, and of putrescent tendency, are very generally sufficient to distinguish idiopathic from any form of inflammatory fever; but in many cases, there is a farther positive distinction in the appearance of peculiar or *specific inflammations of the skin*, subsequent to the attack of the fever, which take different forms,—essentially characterising the fevers that are designated as eruptive or exanthematous,—often appearing also in the simple continued fever,—but never forming any part of the constitutional symptoms that result from local inflammation exclusively.

III. A most important part of the history of what we call idiopathic fever, distinguishing it from the acknowledged effects of inflammation, is its much greater tendency to a *spontaneous favourable termination*. This is shown in different ways. In many cases the febrile symptoms return at regular intervals, of 24, 48, or 72 hours; and subside completely after a cold and hot fit of some hours' duration,

by a spontaneous sweating,—constituting the *Intermitting* form of fever. In others there are equally distinct, but less perfect and less regular remissions of the symptoms, and the term applied is *Remittent* fever. And in the remaining, or *Continued* form of Idiopathic Fever, although we can observe only slight and partial abatement of the symptoms at different hours of the day, we very often observe complete recovery from the most urgent and distressing symptoms, taking place spontaneously at various periods of the disease,—sometimes, in the fever of this country, as early as the 7th or even the 5th day; sometimes not until the 30th, or even 40th day, most generally between the 10th and 20th; sometimes very rapidly, and with evacuations (whether at regular or irregular times) evidently resembling the sweating stage of intermittents; sometimes gradually, and without any such critical evacuations; but under very various treatment,—often without the use of remedies,—and always with less assistance from remedies, and with much less risk of subsequent organic disease, than where recovery takes place from an equally disordered state of the system, consequent on decided internal inflammation.

IV. There is this farther leading peculiarity in the cases of febrile disease, to which we give the name of Idiopathic Fevers, that they are often absent for a length of time, even from large communities, and again at other times, or in other districts, are extremely prevalent; and therefore evidently do not proceed merely from causes which are of general operation, as the exciting causes of inflammation are, but must necessarily result from causes of more local and temporary agency; and accordingly, we have good evidence, that all these idiopathic fevers either originate from a Malaria, or propagate themselves in part at least, and in certain circumstances, by Contagion.

By attention to these particulars in the history of many febrile disorders, even independently of attention to the results of practice, we are authorised to conclude, that they

may be distinguished from the effects of simple inflammation, and belong to the class which we call, for the present, Idiopathic Fevers; and that the *onus probandi* rests with those who would attempt to assimilate them to, or resolve them into, the acknowledged effects of inflammation.

But these Idiopathic Fevers are liable to very considerable varieties; and, setting aside for the present the Eruptive Fevers, we may enumerate two distinct heads of these varieties; in the first of which the distinctions lie in the essential symptoms of the febrile action itself; in the second, in the indications of local and general inflammatory disease, which attend it frequently, although not uniformly, and therefore not necessarily.

I. 1. There is a form of fever, of rare occurrence, but of great pathological importance, which has been lately described under the title of *Congestive;* and although that term expresses what is probably a concomitant, rather than the cause of the peculiarity of the symptoms, yet it is perhaps better to endeavour to fix its meaning, than to substitute another.

In this variety of fever, the symptoms of the earliest, or cold stage, assume their highest degree of intensity; and feebleness of pulse, coldness of surface, muscular debility, and depression of all the functions of the nervous system, approaching, and sometimes amounting, to complete coma, are the leading symptoms. Spasms attend some cases of this kind, and vomiting attends others. Such cases occur now and then in epidemics of common continued fever, but are more frequent in the most malignant epidemic diseases, Plague, Yellow Fever, Cynanche maligna; and many cases of Epidemic Cholera are closely analogous to them. In all these cases, if this first and very dangerous effect of the remote cause of the disease is recovered from, it is usually succeeded by a distinct, but generally feeble, febrile reaction.

2. What is called the *Inflammatory* form of Idiopathic Fever, is the most widely different from the congestive form. In this case, the depression in the first or cold stage

is the least, and the febrile reaction is the strongest, the pulse full, firm and frequent, the skin hot and retentive of its increased temperature; the thirst intense, the urine generally high coloured, the face often flushed, and the febrile pains of head and other parts intense; the senses often preternaturally acute, and the delirium, if present, attended with increased rapidity of thought, and sometimes with violence.

In all cases of idiopathic fever, these symptoms, sooner or later, undergo a change, and pass into the typhoid form more or less completely; but the cases in which the symptoms now mentioned are the best marked, and last longest, and where the subsequent typhoid stage is the least obvious, have the general name of Inflammatory Fever.

3. On the other hand, the name of *Typhoid* Fever is given to those cases in which, after the febrile reaction has been established, the typhoid symptoms already enumerated *,—in the state of the circulation, of the secretions, of the nervous system, and of the blood, are earliest observed, and are most urgent;—the distinction between this and the inflammatory form of fever being therefore a difference in degree rather than in kind.

The term Malignant, as applied to fevers, may be said to include the rare congestive, and the frequent typhoid fever; as applied to epidemics, to denote those in which cases of these two descriptions are the most frequent.

Under the general name of Typhoid Fevers, we may describe three subordinate varieties, which it is in some cases easy and important to distinguish; but which in most instances are blended together, or graduate into one another.

a. When the most obvious and urgent of the typhoid symptoms are those of mere debility of the vital actions,— soft compressible pulse, dry foul tongue and lips, deficient or easily depressed heat of the surface, and extreme muscular debility, shewn in the voice and attitude as well as in the muscular movements,—the name of " Fievre Adynamique" is given by recent French authors, and the term Low Fever is the most appropriate in our language.

b. When the most obvious and urgent of the typhoid symptoms are those indicating derangement of the functions of the Nervous System,—pervigilium, restlessness, tremors or spasms, deafness, contracted pupil, and other affections of the external senses, delirium, especially of the more active kind, and this afterwards subsiding into stupor, —the case has been styled "Fievre Ataxique" by the French, and is generally called Nervous or Brain Fever in this country. This form of fever is most remarkably seen in persons in whom the nervous system has been previously and habitually excited, either by voluntary mental exertion, or strong and lasting emotion,—or by the inordinate use of stimuli, such as alcohol.

c. When the most obvious of the typhoid symptoms are those denoting a dissolved state of the blood, petechiæ, passive hæmorrhages, gangrene from slight irritations, &c. the case has still among many the name of Putrid Fever.

All these varieties may be observed in cases where neither the symptoms before death, nor the appearances after death, give any clear indication of inflammation in any individual organ ; and may be said therefore to be different forms of *Simple Fever.*

II. The more complex and most generally dangerous forms of fever, are those where the symptoms, especially of the typhoid fever, are combined, either from the first or during their progress, with such symptoms as indicate, with more or less certainty, local Inflammatory Action in some part of the body ; and these are most simply divided into Fevers with affection of the head, chest, or abdomen.

It may be stated generally, that inflammations of certain organs in the body are very apt to combine themselves with general fever ; but that the course of these inflammations is evidently modified ; the fixed pains attending them are generally less acute ; their other symptoms often become protracted, and remain nearly stationary for a longer time than in other cases ; and they tend, as will afterwards appear, to terminations which are in some respects peculiar.

The *modifying* effect of fever on local inflammation, is seen where fever attacks a person in whom any cutaneous inflammation and effusion are going on; the appearance of which is usually much altered, and the discharge often suppressed during the febrile state.

1. It is obvious that many of the symptoms of affection of the brain which occur in fever, are the same as attend cases of unequivocal inflammation of the brain, *e. g.* the headach, often violent; the impatience of light and sound; frequent nausea and vomiting; the indications of determination of blood to the head; the delirium, of various character, spasms of various muscles; and ultimately Coma. Such symptoms are perhaps chiefly seen in the fevers of the hottest weather of this climate, and in those of warmer climates. It is also certain, as will be stated afterwards, that unequivocal effects of inflammation have been occasionally found on dissection, after fatal fevers; that more or less effusion of serum within the cranium, which was described as the first effect of inflammation there, is common in such cases; and that the remedies for inflammation, early and prudently applied, have often appeared to relieve very considerably the symptoms of affection of the Nervous System occurring in fever; and therefore, although we shall afterwards see reason to believe that the affection of the brain in fever is by no means simply inflammatory, but partly dependent on another cause, yet we may consider it as ascertained, that a degree of inflammation within the cranium (generally best designated by the title of Subacute), does often accompany idiopathic fever; and is most to be apprehended when the symptoms above mentioned are the most urgent, and when there appears to be danger of death strictly in the way of coma, rather than by reason of the circulation being enfeebled.

2. There are many cases of fever, especially in winter and spring, in which an inflammatory affection of the organs of respiration, marked by cough, hurried or laborious, and sometimes stridulous breathing, and more or less of pain of chest, either accompanies the disease from the com-

mencement, or supervenes during its progress; and in a
number of these, it is obvious that death takes place, or is
strongly threatened, by Asphyxia, from the embarrassed
state of the respiration, rather than by Asthenia, from the
weakened action of the organs of circulation.

This affection of the chest, besides being attended with
more or less of the typhoid symptoms, formerly mentioned,
which make no part of the symptoms in ordinary cases of
idiopathic bronchitis or pneumonia, has a course considerably
different from those diseases. It is often of long duration, is
apparently less under the influence of active remedies; and
although it may be moderated or restrained, is seldom ob-
served to subside completely, until the period of sponta-
neous abatement of the fever, which, in such cases, is often
long protracted. The cough and dyspnœa are generally
much more urgent symptoms in this combination of pec-
toral affection with fever, than the pain of chest; and the
symptoms observed by auscultation and percussion, and
the appearances on dissection, clearly indicate that the mu-
cous membrane of the bronchiæ, and parts of the substance
of the lungs, are very liable to inflammation, of a somewhat
peculiar character, in the course of fever, but that inflam-
mation of the serous membranes within the chest is very
rare.

3. The affections of the abdominal viscera, frequently
attending idiopathic fever, are somewhat various. An at-
tack of jaundice, at least of yellowness of the skin, in the
course of the disease, is frequent and very dangerous in the
fevers of hot climates, and occurs occasionally in this. It
is often attended with pain and tenderness in the situation
of the liver, and such affection of the breathing, such nau-
sea and vomiting, as usually attend inflammation of the
liver; but in some cases, it is unattended with such symp-
toms. In some cases, it is unattended with the usual indi-
cations of jaundice in the stools and urine; and in general,
it has appeared, on dissection, unconnected with any visi-
ble obstruction of the gall-ducts.

In other cases of fever, without jaundice, there is so

much pain and tenderness in the situation of the stomach, and nausea and vomiting, increased by all ingesta, as to justify the belief of inflammation (generally subacute) in the stomach itself. These affections, both of the liver and stomach, in fever, if not early checked, are frequently followed by sudden increase of the symptoms of affection of the brain, and by rapidly advancing coma.

But the most common abdominal affection in fever, is that in which the intestines are chiefly concerned, which comes on at different times, but chiefly, and with most danger, in the later stages; and this is marked sometimes by severe pain and tenderness, but in general chiefly by diarrhœa, seldom violent, but often obstinate; it is attended with occasional griping (often aggravated by ingesta), sometimes with scanty mucous and bloody stools and tenesmus, as in dysentery, but more frequently without such symptoms. It is often accompanied with gradually increasing tympanitic distention, and often occasions long protraction of the typhoid febrile symptoms, in the course of which great emaciation, extreme debility, and often a peculiar dryness of the skin are observed; and in a few cases it is followed, either by sudden exhausting hæmorrhage, or by a sudden attack of acute pain and tenderness of abdomen, with vomiting and rapid sinking.

It is well ascertained that such abdominal symptoms in fever depend very generally on inflammation of the mucous membrane, and especially of the mucous glands of the intestines; that this inflammation tends rapidly to ulceration; and that the attacks of sudden hæmorrhage or of acute pain and tenderness in the advanced stages of such cases, usually depend on erosion of bloodvessels, or perforation of the whole coats, and escape of the contents of the intestines into the cavity of the abdomen, in the course of that ulceration; but that inflammation commencing in, or confined to, the peritoneum, is equally rare in fever, as that of the serous membranes within the chest.

Besides these inflammatory appearances in internal parts, often found after fatal fevers, there are many cases of ex-

ternal inflammation going on to ulceration, and often to
gangrene, which attend the later stages of fevers. These
may often be ascribed to accidental irritation, such as pres-
sure, or the dribbling of urine. They sometimes occur,
especially in the extremities, without any assignable cause;
but from the time and mode of their occurrence, are al-
ways regarded as effects or accompaniments of the fever.

The different local affections now described frequently
succeed each other, or are combined together in the course
of fever, in the same patient; and observation of the symp-
toms of the later stages of most fatal fevers, at least in this
climate, sufficiently indicates that the danger most gene-
rally results from a *combination of one or more of these local
affections* with the typhoid form of the fever, and especially
with the enfeebled state of the circulation.

Whenever the symptoms of any local inflammation have
combined themselves with those of general fever, it is to be
apprehended that the fever will be much protracted; and
in fact, it is frequently by the protraction of the case, ra-
ther than by the intensity of any local symptoms, that we
are led to suspect the local diseases, of which the evidence
may afterwards appear on dissection. There are also great
varieties, not only in different individual cases, but in diffe-
rent epidemies, as to the average duration of the disease,
and as to the intensity of the typhoid symptoms, the fre-
quency of eruptions, or the indications of a diseased state
of the blood,—which cannot be ascribed to the influence
of any external causes, and must be held to denote varieties
in the nature and virulence of the remote cause of the disease.

But although we consider it of real importance to mark
these distinctions, both in the essential symptoms of Fever
itself, and also in the concomitant local affections which
distinguish individual cases, and sometimes epidemies, from
each other, yet it appears equally certain, from considera-
tion of the nature of these distinctions, of the manner in
which the varieties, thus marked, graduate into one an-
other, or are blended together in the same cases, and by the

many varieties which present themselves in the same epi-
demic, and in immediate connexion with each other, that
all the continued fevers of this climate must be regarded as
fundamentally the same disease.

The Intermitting and Remitting Fevers have obviously,
from what was already said of their characteristic symp_
toms, as well as from their remote causes, peculiar cha-
racters, and may be regarded as varieties of a disease dif-
ferent from Continued Fever, although so closely allied to
it, as to be properly included in the same genus. In the
warmer climates, and especially in the lower grounds in
these climates, the external cause of this disease acts with
the greatest virulence; and in these, it is doubtful whe-
ther the continued fever of this climate really exists. But
it is certain that the remittent fevers, in their highest de-
gree of intensity, have nearly the continued form; and
they are then attended with great danger, and shew the
following peculiarities: 1. That their whole progress is much
more rapid than that of the fevers in this climate; 2. That
the symptoms denoting inflammation or an approach to in-
flammation of the brain are often more urgent, in the first
instance, than here; and 3. That the symptoms of inflam-
mation, or a state nearly resembling inflammation, of the
liver and stomach, with or without the occurrence of jaun-
dice, are more urgent, and much oftener appear concerned
in the fatal event.

In different cases, and in different epidemics, of the fevers
of hot climates, there is a variety as to these concomitant
local symptoms; but it appears clearly that there is also a
variety, in different seasons and situations in these climates,
as to the intensity or malignity of the proper febrile symp_
toms; the depression of the vital power of the circulating
system, and the symptoms of dissolved state of the blood,
shewing themselves much earlier, more extensively, and
more intensely in some seasons than in others. When
this is the case, the remissions are the least obvious, and it
is on such occasions that a doubt still exists, whether the
remittent fever does not acquire that most important pro-

perty of the continued, the power of spreading by contagion.

It may be stated, in concluding this account of the symptoms and varieties of Fever, that after the febrile action has subsided, and the patient begun to become convalescent, he is left in a state of weakness and perhaps irritability, in which he is peculiarly liable to inflammatory attacks; the symptoms of which are often obscure, or nearly latent, and very easily confounded with those of the preceding fever, insomuch that it is often difficult to judge, whether death is to be ascribed to fever, or to some of these, its immediate consequences.

Scrofulous affections are likewise very apt to be excited by their usual causes, after the cessation of idiopathic fever; and various other organic diseases often take their origin at that time. In the case of intermitting fevers, and especially of those which are of long duration, and in which the cold stage is long and violent, enlargements of the liver and spleen are peculiarly apt to take place towards the close of, or subsequently to, the disease.

SECTION II.

OF THE APPEARANCES ON DISSECTION AFTER IDIOPATHIC FEVERS.

THE first fact to be borne in mind in this part of the subject is the occasional entire absence, after fatal fever, of any appearances, which can be strictly called morbid; *i. e.* of any which are not frequently observed, in cases either of sudden and violent death, or of death from causes allowed to be unconnected, either with general febrile action, or with any symptoms of disease of the parts, where they are found. It may be allowed, that this is a rare case; but it is not on that account the less pathologically important, and it is admitted by the most accurate morbid anatomists as an unequivocal result of their inquiries.

Next, it is to be observed, that the morbid appearances, found after fatal fevers, are often observed to be remarkably various, even in cases, the leading symptoms of which are nearly the same; and that they are far from bearing any fixed proportion to the intensity of the symptoms of affection of the parts where they are found.

This may be ascribed in a great measure to the enfeebled state of the circulation at the time when these local affections take place, rendering them, as has been already stated, frequently *latent*.

In regard to the nature of the morbid appearances which are found after death by fever, it is to be observed, that they are almost uniformly indications of inflammation; but this inflammation is distinguished by two peculiarities, *first*, that it is seated very generally in certain textures only; and, *secondly*, that its effects are apparently more limited than in other cases, and in particular the effusions of coagulable lymph and of pus are found to a very small extent, in comparison with what is seen in idiopathic inflammation of the same parts. Indeed there are so many fatal cases of fever, attended with evident local affections, and shewing on dissection marks of local inflammation, in which no effusion of lymph or pus appears on dissection, that it may be suspected, in the comparatively few cases where such effusions to any considerable extent have been described, that they had resulted from simple inflammation immediately succeeding (as often happens) to the fever, rather than that they had taken place during the fever itself.

I. Within the cranium, the morbid appearances found after death from fever, are in by far the greater number of cases, confined to increase of the natural serous exhalation on the different surfaces, particularly in the ventricles, and beneath the arachnoid coat;—in which situations in the case of fever, (although not in strictly inflammatory cases) the increased exhalations are very generally found simultaneously. This effusion may be held to be morbid, whenever it is of such extent as obviously to distend the ventri-

eles, to elevate the arachnoid coat, or to widen the depressions between the convolutions of the brain *.

Such morbid effusion is probably the most frequent of any morbid appearances after continued fever in Scotland; but it is to be observed, that it is frequently found likewise after inflammatory diseases, in which abundant cause of death appears on dissection in other parts of the body. It is also found after many cases of chronic disease of different parts of the body; and this circumstance renders it somewhat difficult to judge, how far it can really be regarded in the cases now in question, as an effect of fever; but when it is found in a person who was in perfect health ten or fourteen days before his death, and in whom febrile symptoms and affections of the head resembling the usual effects of inflammation there have intervened, we cannot hesitate about regarding this, which is an acknowledged result of inflammatory action, as a morbid appearance strictly connected with the fatal fever. It is important, however, to observe, that the whole amount of this effusion within the cranium, in cases of fever, seldom amounts to an ounce; and is very generally much less than in fatal cases of idiopathic inflammation within the cranium, whether acute or chronic.

An injected or unusually turgid state of the bloodvessels within the head, especially of the pia mater and substance of the brain, is often observed after fatal fevers, and is probably often an effect of the same condition of the vessels, from which the effusion results; but agreeably to what was formerly said, we are not entitled to deduce from that appearance alone, any inference as to inflammation, or even morbid congestion of blood in the part before death.

In a few instances, after fatal fever, a little extravasation of blood has been found within the cranium; and in a greater number, where paralytic strokes have taken place in the course of fever, we are pretty certain, that such extravasation has occurred. In a few cases also, effu-

* See ANDRAL, Clin. Med. t. i. p. 418.

sions of lymph on the cerebral membranes, and even deposits of purulent matter, either circumscribed or diffused, have been found; but in some of these, at least, it may be doubted, whether these decidedly inflammatory effusions had taken place during the true febrile state.

The appearances now mentioned may be supposed to have connexion with the comatose tendency, and the death in the way of coma in Fever; but they are sometimes altogether absent in cases of that kind, and their amount cannot by any means be anticipated from observing the duration or intensity of that tendency. It is certain, that neither unusual hardness, nor unusual softness, of the substance of the brain, is uniformly, or even very frequently, connected with the symptoms of fever, and that any indications of disease of the dura mater during fever are very rare.

In the Spinal Cord, appearances similar to those now described in the brain, have been occasionally observed, but do not appear to be very common, nor can any uniform connexion be traced between the appearances there, and spasms or other affections of the voluntary muscles in fever.

II. The morbid appearances found in the air-passages and within the chest after fatal Fever, and which are often evidently connected with the death by Asphyxia in fever, are the following.

1. There is, in a few cases of fever, an inflammation, generally a peculiar aphthous inflammation, of the mucous membrane of the fauces and larynx, and the thickening and exudation in the latter part may be to such extent as to embarrass the respiration very materially, and conduce to the fatal event. But it is very seldom that the mechanical impediment to the access of air to the lungs, produced by inflammation of this part during the progress of the true febrile symptoms, is very great.

2. In a great proportion of fatal cases of fever, more or less of the usual indications of inflammation of the mucous

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membrane of the bronchiæ, vascularity and thickening, and effusion of viscid or frothy mucus, are found on dissection; and in some cases these effects of Bronchitis are so general, in both sides of the chest, as to afford a satisfactory explanation of much dyspnœa, and of death by asphyxia.

3. In a considerable number of cases there is found a decidedly morbid amount of serous effusion into the pulmonary cellular substance itself, which is discharged on cutting and pressing that substance.

4. In many cases there is found after fatal fever, condensation of part of the substance of the lungs, known by its not crepitating under the knife, and often likewise by its sinking in water, and attended with softening. But this condensation very generally differs from the hepatisation formerly described, in having a darker and more uniform colour, and not shewing the characteristic appearance of granular lymph *.

In regard to these appearances in the substance of the lungs it is to be observed, that they frequently coexist with the indications of Bronchitis, already mentioned; and that in such cases, if they are found only in the posterior or depending portions of the lungs, and nearly alike in both sides of the chest, although not strictly *post-mortem* appearances, yet they indicate only congestion of blood, and consequent extravasation taking place within the last few hours of life; when the blood, in consequence of its defective arterialization, and of the enfeebled action of the heart, is making its way so slowly through the capillaries of the lungs, that it is liable to the influence of gravitation, and stagnates so much in the lowest of the vessels of the lungs, as to distend these vessels permanently, and to transude from them more or less completely into the adjacent cellular substance.

That these results should follow from the languid movement of the blood through the lungs, in this and other acute diseases, when the blood is in full quantity, its vitality probably impaired, its arterialization impeded, and the powers propelling it much depressed, is what may readily be anti-

cipated; and that this is the real explanation of the appearances now described, in many cases of fever, seems sufficiently demonstrated by their occupying so strictly, in many such, the depending portions of the lungs,— by their being often found in that situation where no pneumonic symptoms had occurred,—and by two observations of LAENNEC, 1. That he had repeatedly satisfied himself, by auscultation, of the commencement of this " Peripneumonic des Agonisans," only at the time when the powers of life were prostrate; and 2. That in one case, where in consequence of sores on the back, the patient was constrained to lie on his face, for some time before death, the very same appearances were found in the *anterior* (but still the depending) portions of the lungs.

When the effusion of serum, or extravasation of entire blood, into the cells of the lungs, are found in parts that do not lie lowest, or variously disposed throughout the lungs, it may confidently be inferred that they are the effects of an inflammatory action; but somewhat modified by the presence of the typhoid fever, so as to give results in some measure different from what are seen after other cases of inflammation there.

5. There are some cases, in which real gangrene of the lungs, known by perfect flaccidity and putrid smell, and generally denoted before death by the peculiar fœtor of the breath, is found as a consequence of inflammation of the lungs, accompanying Fever; as in other cases where pneumonic inflammation is attended with great weakness of the circulation.

Evidence of inflammation of the pleura or pericardium is very rarely seen after idiopathic fever, except in cases where the progress of the symptoms gives reason to believe that a simply inflammatory attack had supervened on fever already on the decline.

III. The alterations of the Liver found after fever, and which can be regarded as consequent on it, even where there has been yellowness of the skin, very seldom amount

to more than partial enlargement and softening, and injection of minute vessels. In the spleen morbid softening is more common; and much but various alteration of the appearance of the bile, after fatal fevers, has been remarked by ANDRAL and others ; and is important to be noticed, as it may possibly be concerned in producing the affections of the intestines now to be mentioned.

The morbid appearances in the mucous membrane of the Stomach and Bowels often seen after fever, demand careful attention. They are seen frequently in cases where there has been much affection of these parts during life, but bear no fixed proportion to the intensity of the symptoms denoting such affection ; and in cases that are long protracted, they are often observed to an unexpected extent, when the functions of the bowels had appeared to be very little deranged.

It may be said in general, that these appearances differ from those commonly seen after idiopathic inflammation of the same parts (e. g. in dysentery), in the inflammation being here more limited to spots on the membrane, and the effusion of lymph consequent on it, being to a much less extent.

The marks of inflammation of this membrane found after death by fever, are generally the following.

1. Brownish-red patches, generally with a reddish coloured mucus lying on them. But this appearance, if confined to parts that lie lowest in the position of the body in the last hours of life, and after death, is by no means to be trusted as an indication of previous inflammatory action. 2. Softening and thickening of the membrane at the parts so discoloured, which, if accurately and carefully described, are much better signs of real disease than any variations of mere colour *. 3. Effusions of lymph, in

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* In the fevers of hot climates, which are so rapidly fatal, the morbid appearances found in the abdomen, and connected with the incessant retching, and ultimately with the black vomit, are generally confined to the appearances now described, existing often in an intense degree in the mucous membrane of the stomach, but without exudation of lymph or ulceration.

spots dispersed over the surface, which adhere for a time to the mucous membrane itself, and sometimes take much the form of exanthematous diseases. 4. Ulcers of various size and form, generally rather thinly scattered, excepting at the lower end of the ileum, where they are often set in clusters; very generally preceded by some effusion of lymph, and formed sometimes by the ulcerative absorption only, in other cases in part by sloughing of the membrane.

All these appearances are observed sometimes in spots of the mucous membrane itself, but more generally in the portions of that membrane already occupied by the small mucous glands, named Glands of PEYER and BRUNNER. They are most common in the ileum, especially its lower extremity, next in the cæcum and colon, and next in the stomach, and are rarest in the duodenum. They are very often attended with vascularity of the corresponding parts of the mesentery, and enlargement and injection of the corresponding mesenteric glands.

Such unequivocal disease of the mucous membrane of the alimentary canal is found, either alone, or in combination with the other diseased appearances above mentioned, in a majority of fatal cases of continued fever, which occur in Paris, and in a large proportion of those that occur in London; but in a much smaller proportion of fatal cases in Scotland. They are decidedly more frequent, at least in this country, after the fevers of children and young persons than in advanced life; and in fevers that are fatal at an advanced period than in those that are rapidly fatal.

We have good evidence that the ulcers thus formed may be afterwards cicatrized; but there are also a certain number of cases, in which dissection shews that the ulceration has extended to vessels of such size as to give a copious discharge of blood; and others in which it has led to perforation of the whole coats of the intestines, escape of their contents, and consequent rapid and fatal inflammation of the peritoneum. These effects of the ulceration are almost always made known by the sudden attacks of hæmorrhage, or of violent pain and sinking, formerly mentioned; and

.these symptoms sometimes commence at so late a period, after the febrile action has subsided, as to indicate that the fever is by no means necessarily coexistent with the formation or even the extension of these ulcers.

It is important to observe that the external inflammations which often attend the later stages of fever, both those caused by irritation, such as pressure, and those which occur spontaneously, e. g. in the parotid glands, or in the feet and toes, are found to exhibit characters, during life, and after death, which distinguish them from the more usual inflammations of the same parts; they often tend to ulceration, and often to gangrene, but seldom to effusion of healthy pus, and hardly ever to the formation of granulations, while the general febrile action continues.

When pains are taken to distinguish the truly morbid appearances left by fever, from appearances (such as staining of the inner membrane of arteries, or of the mucous membrane of depending portions of bowels) which may be fairly ascribed to changes taking place after death, in a body where the coagulation of the blood is imperfect;— and likewise from the effects of inflammations often rapidly supervening during the convalescence from fever;—we shall not be authorized to consider more phenomena than those now described, as certainly belonging to the former class. When the more chronic sequelæ of fever prove fatal, they leave a much greater variety of appearances behind them. In particular, when the enlargements of the liver and spleen, so often consequent on Intermittent Fever, end in a fatal chronic disease, the appearances usually found are just the same as are common, when there has been long-continued obstruction to the course of the venous blood in the thorax, and consequent congestion in these viscera ;—viz. enlargement, hardening, increase of the whitish cellular substance in the parenchyma, and ultimately the development of tubercles there. And the circumstances preceding the formation of such organic disease, in the case of long-continued intermittents, (especially Quartans, where there have been frequent long cold stages, implying congestion of

blood in the great internal veins, and at the same time feeble circulation),—and again, in cases of mechanical obstruction of the venous circulation,—mutually illustrate one another.

SECTION III.

OF THE REMOTE CAUSES OF IDIOPATHIC FEVERS.

REFERRING, first, in this part of the subject, to what has been already said *, of the marks by which we can confidently distinguish a disease that results from some local and temporary cause, from one the causes of which are generally diffused, and pretty uniformly recurring,—we observe, that all Idiopathic Fevers, Intermittent, Continued, and Eruptive, appear evidently to belong chiefly, if not exclusively, to the former class; because they are all observed to prevail generally, and affect many persons in quick succession, in certain places, and at certain seasons; and are almost or entirely absent, for long periods, from other large communities, or from the same at other times.

It is to be remarked, however, that continued Fever is on a footing somewhat different, in this respect, from Intermittent Fever, and from most of the Eruptive Fevers, or Exanthemata; because although sometimes nearly absent, and not spreading epidemically, it cannot be ascertained to be ever completely absent, from any large community in this climate, for any considerable length of time; whereas the other diseases now mentioned, have been often known to be absent from whole kingdoms, and for centuries. This is a *prima facie* ground for suspecting, that the occurrence of this disease may be determined, on some occasions, by causes of more uniform and permanent existence than that from which it more generally proceeds; and accordingly, it will afterwards appear, that we have good evidence of its occurring in certain circumstances, independently of the application of contagion.

* P. 359.

Referring, again, to what was said before *, of the marks by which an epidemic disease, depending on a cause which arises from the soil, or is generated in the atmosphere in particular situations, may be distinguished from one that is propagated by the intercourse of the sick with the healthy,— we assert with equal confidence, that Intermittent and Remittent fevers are in the former predicament, and Continued fever, and the Eruptive fevers in the latter. The experience of very numerous observers since the time of LANCISI has shewn, that fevers of the former class prevail only in certain localities,—that these localities resemble one another in certain respects,—and that at a distance from these localities, all manner of intercourse of the sick with the healthy may take place, without a fresh case of the disease shewing itself. On the other hand, we are equally assured by very extensive experience, that all the facts formerly referred to †, as evidence, that the occurrence of fresh cases of a disease, is determined by the circumstance of intercourse with the sick, and is therefore referable to effluvia arising from the bodies of the sick,—are facts constantly observed as to the diffusion of continued fever, or of the eruptive fevers, through any community in which they become epidemic.

It remains for us to state here, what has been ascertained as to the conditions under which these agents, known to us only by their effects, but so powerful in their action on the human body, are developed ; and as to the circumstances by which their activity is increased, and their effect on the living body variously modified.

I. The whole conditions necessary to the development of the Malaria which excites Intermittent and Remittent Fevers in many parts of the earth's surface, (and to so great an extent, that no other single cause of mortality perhaps acts with equal effect), are certainly not known ; because the disease is found in some districts, where, judging from the analogy of others, it would not have been expected,

and is absent from others, where all the conditions that are yet ascertained for its development appear to exist; but what is usually observed is, that the districts infested by it are those where water has stagnated for some time, often months, on the earth's surface, and afterwards slowly evaporated under the heat of the sun; it is only after the evaporation is somewhat advanced, that the disease shews itself; and it often continues long, and with great virulence, after the surface is perfectly dried. The putrefaction of animal or vegetable matter is, naturally, a very frequent concomitant of the process, by which the Poison is thus developed; but the facts stated by Chisholm *, and Fergusson †, seem sufficient to shew that it is not an essential part of the process.

The following general facts appear so well established by observation, as to be correctly designated as laws regulating the agency of this poison; and the knowledge of these, as well as of the conditions of its development now stated, may often be effectual in preventing its ravages.

1. Its virulence appears to be nearly in proportion to the intensity of the heat, by which the surface emitting it has been dried. The Intermitting Fever of northern Europe, the Remitting Fever of the Mediterranean, and the Yellow Fever of the West Indies, are produced in circumstances in all respects similar, except as to the intensity of the heat; the worst fevers of the tropical climates are nearly confined to a moderate elevation above the level of the sea; and at the same time when they are prevailing in the low grounds, the common remittent fevers are often prevalent in the neighbourhood of marshes a few hundred feet higher. The greater heat of certain seasons, and the more complete evaporation of stagnant water, seem to be powerful causes of the greater prevalence and malignity of fevers of this class; but it must be allowed, that unusually virulent epidemics occasionally occur, for which no such known cause can be assigned.

* See Edin. Med. & Surg. Journal. vol. vi.
† On Marsh Poison. Edin. Phil. Trans. vol. ix.

2. The poison does not appear to diffuse itself readily through the air, nor to rise high above the surface emitting it; the inhabitants even of the ground-floor of a house in a malarious district being often affected in a much larger proportion than those of the upper stories.

3. Although the heat of the sun appears to be one of the conditions of the development of the poison, yet its immediate effect on the poison that has been already evolved, seems to be to dissipate and dilute it, for it is much more dangerous to visit the most malarious spots at night than at noon-day.

4. The poison appears evidently to be wafted along the earth's surface by winds; for the disease prevails much more, where the trade-winds blow, to the leeward than to the windward of marshes.

5. It appears to be absorbed or neutralized by passing over water,—ships having been observed to remain quite healthy within 1000 yards of shores, even to windward of them, where the disease was very prevalent.

6. It appears to attach itself particularly to spreading trees; on which account woods and groves are particularly dangerous in malarious countries; and again, when these intervene between a marsh and a town or village, they often appear to afford it protection.

7. Its development, or its virulence, appears to be much diminished by the cultivation and habitation of waste lands, even although they be occasionally flooded; and it has often been found to increase suddenly and greatly, when fertile lands have been laid waste.

8. It affects very differently the permanent inhabitants and the occasional visitors of the districts where it exists; the former being very generally weakly, imperfectly nourished, and short lived, but much less liable to the fever itself than the latter.

9. In the hot climates there is an equally striking difference between the white and black varieties of the human race as to their liability to the effect of the malaria;

the blacks, even when healthy and robust, suffering from it comparatively little.

10. In all climates, this, like other causes of acute disease, acts with peculiar force on those whose bodily strength is at the time unusually depressed, whether by fatigue, intemperance, fasting, evacuations, or mental emotions ; and whatever measures are effectual in permanently strengthening the system, are found the most useful in enabling it to resist this noxious influence.

11. In those who have certainly imbibed the poison producing these fevers, it appears very generally to *lie latent* for a considerable length of time before the effect results. In some cases, in this climate, it is quite certain that this latent period may not be less than four months.

12. What was formerly said of the frequent *concurrence* of the more general causes of disease, such as cold, intemperance, or any cause disordering the stomach, with the special cause of certain diseases, is strictly applicable, as many observations prove, to the action of malaria in producing intermittent or remittent fevers ; and by the application of such causes, intermitting fevers are often reproduced, more or less perfectly, in persons who have previously suffered from them, but have not lately been exposed to the malaria.

In regard to the disputed question, Whether all the worst epidemic fevers of hot climates can be referred to the agency of this cause, or whether there exist, occasionally, in these climates, fevers of peculiar malignity, which are propagated by Contagion,—it may be held to be established, that the cause of intermittent and remittent fevers does sometimes act with such intensity as to produce both a very unusual extension of disease, and all the worst symptoms, and the rapid and great mortality, of the most malignant form of fever ; and farther, that in by far the greater number of cases [*], where malignant epidemics, in the hot climates, have been supposed to be imported from a dis-

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[*] See CHERVIN, Examen des Principes de l'Administration en Matiere Sanitaire. Paris, 1827.

tance, their origin has really been proved to be indigenous; and must be ascribed, therefore, to the unusual efficiency of the causes of fever previously existing in the districts. There is good reason to believe also, that even the worst epidemic fevers of hot climates, are always subjected to the same law as the common remittent fevers, of existing only within certain limits.

But from all this it does not necessarily follow, that the extension of these epidemic fevers, or even that their origin, in certain spots, may not be the effect of contagion : For although it may seem improbable, *a priori*, that a disease should spread in two distinct ways, and although we may not expect, that one which results from a cause existing in the atmosphere, should also be propagated, in part, by communication between individuals,—yet no such speculative opinions can be allowed to invalidate the direct and obvious conclusion from facts (of which several have been recorded), which indicate that, in some of the places where these epidemic fevers have prevailed, those who have had close intercourse with the sick, have become themselves affected in a much larger proportion than others who, in all other respects, were similarly circumstanced.

II. In regard to Contagion as a cause of continued fever, we shall first state what has been ascertained of the laws according to which the propagation of fever, by contagion, takes place (and which are found to apply, in some measure, to the other febrile contagious diseases) ; and afterwards we shall consider the question, Whether another origin can, in any circumstances, be assigned for these diseases?

1. The extension of continued fever, in any community, is in general proportioned, as may naturally be expected, to the frequency and closeness of intercourse of the healthy with the sick, and therefore to the crowding, and deficient ventilation, of the rooms which they inhabit; but in different seasons, it takes place with very various rapidity, independently of the application of any causes which are known to affect it; and from this varying diffusibility, as

well as from the varying character and malignity of the disease (already noticed), it may be inferred that the contagious poison itself, as developed in the human body, is liable, from time to time, to a certain degree of change.

2. The contagious matter, arising from the bodies of the sick, appears to be readily diffused through the air, and to lose its poisonous quality by dilution ; so that, at the distance of twenty or thirty yards, air which has passed over the bodies of persons ill of continued fever, is found to be innocuous. The contagious effluvia from smallpox, and perhaps still more from measles, appear to be more virulent than those from continued fever ; and it would appear that the poison of the plague, as arising from the bodies of the sick, is confined within narrower limits than that of any of these diseases.

3. There is good evidence of the contagious poison of continued fever (and of the eruptive fevers also), often attaching itself to fomites (clothes, furniture), &c. and acting on persons to whom it is thus applied at the end of weeks, or perhaps of months.

4. It seems certain, that the Contagious Poison producing any of these diseases, is rendered innocuous by a temperature of 120° of Fahrenheit *. It has been observed, that intense atmospherical heat (though considerably below this point) has repeatedly checked the diffusion of plague, and of small pox ; and the continued fever of this climate is very generally observed to abate in frequency in summer weather, and appears nearly incapable of spreading by contagion within the tropics.

5. Diseases proceeding from these contagious poisons differ from the fever excited by malaria in this important particular, that the susceptibility of them is much diminished by their being once excited in the system. This does not confer certain immunity in the case even of the eruptive fevers ; and there are many cases of continued fever affecting the same person twice or even thrice ; but there

* See Henry in Philosophical Magazine, 1832.

is certainly a great diminution of susceptibility in all these cases.

6. Young persons are certainly more susceptible of these contagious febrile diseases than persons advanced in life; but the symptoms are very generally worse, and the tendency to spontaneous recovery is much less strong, in advanced than in early life.

7. The susceptibility of the disease (in the case of continued fever in particular) is very much increased by many causes that depress the vis vitæ at the time, by fasting or low diet, by cold long applied, by foul or vitiated air, and by mental depression, timidity, or anxiety, as in the case of besieged cities, communities suffering peculiarly from famine and poverty, beaten armies (especially after the excitement of military operations is quite over); or in that of dispirited bodies of men for military or naval service, or of strangers from the country in their first residence in large towns.

8. After any of these poisons have been imbibed, they very generally lie latent in the constitution for a certain length of time, before producing their specific effects; and in the case of continued fever this time is so various, and the efficacy of concurrent and accessory causes (especially of exposure to cold) in exciting the disease, after the application of the contagion, is so obvious and striking, that it appears quite reasonable to suppose, that where these causes are carefully avoided, many cases of the disease, which would otherwise have occurred, may be averted.

9. Although it must always be remembered, that there are great varieties, both as to individual cases, and as to the general character of epidemics, for which we can assign no cause, yet various facts have been ascertained, as to the effects of concurrent or accessory causes, in not merely favouring the accession, but determining the form or variety, of continued fever in individuals, particularly the following.

a. The Nervous or ataetic form of fever (which is perhaps the most generally dangerous to adults in this country)

is remarkably more frequent in those in whom the Nervous System has been recently much excited, as by much muscular exertion, by excessive study, by mental agitation or anxiety, by venereal excesses, or by intemperance, especially the use of strong liquors. In many of this last class, the nervous symptoms in fever take very much the form of the delirium tremens of drunkards.

b. The symptoms of fever are often modified by preceding disease, and especially, if there has been recently any local inflammation, the symptoms of that local disease are very often re-excited, although in a somewhat modified form. On the other hand, a chronic disease already existing, at least if it be one which is attended with febrile excitement (such as phthisis) seems to be to a certain degree (although not uniformly) a protection against attacks of fever.

c. The concomitant local affections, if not the proper symptoms of fever, are remarkably modified by the weather and season of the year, *i. e.* by the causes of local disease which are apt to take effect on the body along with, or after the application of, the poison. In winter and spring, the symptoms are stated to be generally more inflammatory, and the complication of fever with bronchitis or pneumonia is certainly more frequent; in autumn the concomitant affections of the stomach, and especially of the intestines, are chiefly observed. Violent affection of the brain, in the more inflammatory form of fever, is remarkably observed in hot climates, and sometimes in the hottest season of this.

d. There is a remarkable difference in the most general form of fever, according as the patients are placed in cool well aired rooms, or confined in a close warm and vitiated temperature. It is very doubtful whether the mortality is so much less in the former case, as has been represented by some; but in that case, the pulse is generally firmer, the fever less typhoid, and the danger more dependent on complication with local affections, and consequent protraction of the disease; and in the latter case the typhoid symptoms are more frequent and more urgent *.

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* See BATEMAN on Contagious Fever p. 135.

It has been already stated, that continued fever, although rare in some seasons, and prevailing epidemically in others, is still, to a greater or less extent, so much more uniformly present in every large community, than any of the other diseases, which we ascribe to a local and temporary cause, that we may reasonably suspect it to originate occasionally from some circumstances of more general and permanent existence. And in confirmation of this it may be observed, *first,* that continued fever often breaks out in situations where the application of the contagious poisons, whether by persons or families, not only cannot be traced, but appears improbable; and *secondly,* that circumstances may be stated, in which the appearance of this disease, independently of any perceptible application of contagion, may be reckoned on, with almost absolute certainty; *e. g.* the combination of deficient nourishment, foul air, and mental depression, consequent on the reception of a beaten army into a small town, or on a large town long kept in a state of siege, or on a scarcity befalling an already impoverished country. In these circumstances it appears highly probable, that the circumstances of predisposition above stated are adequate, not only to the extensive diffusion, but even to the generation in a few individuals, of the disease which is afterwards propagated by contagion. But to which of these circumstances of predisposition, the occasional spontaneous origin of the disease may with most probability be ascribed, is still uncertain. The vitiation of the atmosphere by putrescent animal or vegetable substances, or by crowded human beings, has been supposed to be a sufficient cause; but so many instances have been collected by Dr Bancroft, Dr Chisholm, and others, of these causes being fully applied without any such effect, that we must set aside that hypothesis; and perhaps we may assert that long continued mental depression and anxiety, during youth especially, has been assigned with more probability than any other cause, for the spontaneous generation of continued fever *.

* See Cheyne and Marsh in Dublin Hospital Reports, vol. iv.

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SECTION IV.

OF THE PROXIMATE CAUSE OF IDIOPATHIC FEVERS, AND OF THEIR FATAL TERMINATIONS.

REFERRING to what was formerly said (p. 428.) of the limitations which Nature imposes on all explanations of natural phenomena, we hold it to be unreasonable to expect, that we shall ever go far in explaining the peculiar phenomena of Fever; we look chiefly for the determination of ultimate facts or principles, relative to the action of its remote causes on the living body.

The first question here is, whether the term Idiopathic be in reality correctly applied, or whether we can explain all the phenomena that have been now described by reference to a principle already explained, viz. the effect of local Inflammation in exciting the constitutional fever which was described, and the known varieties of which were considered.

In treating of this question, we may, in the first place, refer to facts already stated, as to the history of fevers.

Taking for granted that what we have called Idiopathic Fevers may be distinguished, in almost all cases where their whole progress is observed, by the marks formerly enumerated,—that the marks of local inflammation attending them, both during life and after death, are often slight and sometimes absent,—that their symptoms have very generally more or less of the character to which we gave the name of Typhoid,—that they have a peculiar tendency to spontaneous favourable changes, even from very unfavourable circumstances,—and when they do so terminate favourably, seldom leave behind them such organic diseases as most frequently follow cases of decided inflammation left to nature,—and that these fevers occur generally in epidemics, are at times nearly absent, for a long time, even from large communities, and appear certainly to depend, for the most

part, on causes of local and temporary operation ;—we re-
gard all these circumstances in their history as affording
very strong presumption, that they are specifically distinct
from the strictly inflammatory diseases, and cannot be
ascribed to inflammatory action as their cause. And the
following considerations may be stated in farther confirma-
tion of this doctrine.

I. The peculiarities of the occasional and local produc-
tion, and introduction into the system, of the exciting
causes of fevers, and of the characteristic depressing agency
on vital action, which attends idiopathic fever, evidently
assimilate, in some degree, this form of disease to the
agency of poisons. Now, it appears from what was stated
formerly in regard to all such poisons as act gradually, and
must be absorbed into the system before they take effect,
that although they may excite local inflammation, yet they
have always a *general* effect, and usually a depressing ef-
fect, on vital action, whether of the nervous or vascular
system, independent of that local agency. From this there
arises a manifest presumption that the agency of malaria and
of contagion, in producing fever, will in like manner be,
in part at least, exerted on the system at large, and inde-
pendently of local inflammation, or mere alteration of the
distribution of the blood.

II. Although it is freely admitted that appearances indi-
cating inflammation are very frequently found after fatal
fever, yet the facts already stated as to the morbid anatomy
of fever justify our maintaining, *first*, That all such ap-
pearances are sometimes absent; *secondly*, That the indi-
cations of inflammation, found in the different parts above
enumerated after fever, are very generally somewhat dif-
ferent from those which are found after inflammations
of the same parts excited simply by cold, and unconnect-
ed with the peculiar symptoms of fever; which implies
the action, in cases of fever, of a peculiar cause, distinct
from inflammation ; and, *thirdly*, That the appearances of

inflammation, found after fever, are very often quite in-
adequate to explain the fatal event, on the principles for-
merly stated as to the fatal terminations of inflammatory
diseases.

It is plain that, in order to prove that fever depends es-
sentially on, and is fatal by reason of, the attendant in-
flammation, it is necessary to shew, not only that such at-
tendant inflammation exists, but that its nature and situa-
tion are such as to obstruct some function necessary to
life,—or at least such as are found, in other cases, incompa-
tible with life. If therefore, we find after fatal fevers (cha-
racterized by typhoid symptoms), marks of inflammation in
certain organs, but these in a degree much less than those
which we are accustomed to find, where the same parts
have been inflamed, but the characteristic typhoid symp-
toms not shewn themselves, we are not entitled to infer that
the inflammation in the former case was the cause of death.

Now, the effects and indications of inflammation, found
after fatal fevers, and already described, are generally *much
less* than what we are accustomed to observe in those cases
of inflammation of the same parts, which are unconnected
with malaria or contagion, and unattended with typhoid
symptoms; and frequently all that is seen indicates only
congestion of blood, which can hardly be held to be a suffi-
cient cause for death, if existing alone, any where but in
the brain, or at the origins of the nerves.

Even, therefore, where the evidence of inflammation, or
irregular distribution of blood, having existed during fever,
is held to be decisive, the proof of these having existed to a
degree which can be reasonably considered adequate to the
explanation of the fatal event, is very often essentially de-
fective.

III. Not only the fatal event, but the chief peculiarities
of the symptoms, of the diseases described under the name
of Idiopathic Fevers, are very often inadequately explained
by reference to any of the known phenomena and effects of
inflammation.

The different authors who ascribe fevers to inflammation
as their cause, are not agreed as to the organ in which that
inflammation must reside; which circumstance is of itself
a presumption against their common doctrine. But there
is no locality which can be assigned to the inflammation
attending fever, which can explain, by reference to the
known effects of inflammation in other cases, many of the
typhoid symptoms of fever.

The preternaturally·fluid state of the blood, which is very
often, although perhaps not uniformly observed, certainly
cannot be explained thus. The enfeebled state of the cir-
culation in typhoid fever has been thought by some to be
sufficiently explained by the known sedative effect of in-
flammation of the intestines on the heart's actions; but, be-
sides that there are many cases of truly adynamic fever,
where no distinct traces of intestinal inflammation can be
detected, the two cases are very different;—the depressed
state of the circulation in cases of inflamed intestines being
preceded by much more decided local symptoms than we
see in fever, and being neither attended with the cutaneous
heat of fever, nor with the foul dry tongue and lips of fe-
ver, nor with the nervous symptoms of fever, nor with the
strong salutary tendency of fever. And although some of
the symptoms produced by inflammation of the brain re-
semble the nervous symptoms of many cases of fever, yet
in simply inflammatory cases, there are more sudden and
violent attacks of pain,—there are very generally sickness
and vomiting,—there is at one period of the disease slowness
or irregularity of pulse,—the delirium is of a different cha-
racter,—there is less stupor in the early stages, and the
stupor in the later stages is attended very generally with
dilated pupil, squint, blindness, or double vision, and is
much more uniformly fatal, than in the fevers described as
idiopathic.

Farther, the appearances indicating inflammation, which
are found after death by fever, are in many cases observed
to correspond, not to any of the symptoms of the earlier
periods of the fever, but to symptoms which presented

themselves only recently before death; so that the period of accession, as well as the nature and degree of the inflammation, that can be ascertained to exist during the fever, is inconsistent with the supposition of all the symptoms depending upon it.

In farther proof, that the characteristic symptoms of fever are not explained by the inflammations which may accompany it, we should observe, that there are various cases, formerly noticed, besides that now in question, in which inflammation is attended with typhoid fever ; e. g. the case of inflammation from an injury attended with violent concussion, the case of inflammation and purulent effusion in a vein, the case of inflammation from a poisoned wound, or from epidemic erysipelas, or other exanthematous disease, or puerperal fever ; and in every one of these, it is obvious that the system is subjected to the influence, not only of a local inflammation, but also of a cause acting generally on the body, as we suppose the poison of what we call Idiopathic Fever to do.

And if the local inflammation, which can be ascertained to take place during fever, is inadequate to explain the characteristic typhoid symptoms, it is equally in vain to seek an explanation of these symptoms, as some have done, in the mere circumstances of irregular distribution and *congestion* of blood.

Even the peculiarities of that form of fever which has been described under the name of *Congestive* (p. 486.) are not to be explained by the mere circumstance of internal congestion, the existence of which, in the vessels and especially in the veins of internal parts, in these circumstances is admitted. For although congestion or stagnation of blood within the cranium may be held to be a sufficient cause of stupor, yet we are so far from regarding congestion in the great veins leading to the heart, as a sufficient cause for deficient action there, and consequent feeble pulse and cold skin, that we have already stated, (see p. 445.), the accumulation of blood in the great veins to be apparently the chief cause of the *increased* action of the

heart, or the *reaction*, in the more usual form of fever. In the cases, therefore, where the congestion in the great veins fails to excite this reaction in the heart, some peculiar cause must have operated, to prevent the heart from being unusually excited by the application of the unusual quantity of its natural stimulus; *i. e.* the circumstance of a congestion in the great veins, greater and more permanent than is usual in the commencement of fever, is in all probability the effect, not the cause, of a peculiar sedative influence affecting the vascular system; which will naturally lead to accumulation of blood in the great veins, for the same reason that determines the accumulation there after death.

That congestion of blood in the great veins is not *per se* adequate to account for the phenomena of any form of fever, appears distinctly from the fact, that no form of fever follows the great congestion there in cases of suspended animation in syncope, or from extreme cold, or submersion in water.

IV. That what we called Idiopathic Fever cannot justly be regarded as the effect of the inflammations often attending it, appears farther from a very sufficient experience of the *juvantia* and *lædentia*, particularly from what is well ascertained of the effect of evacuations on the one hand, and of stimulating remedies on the other, in this disease, as compared with the cases that are acknowledged to be simply inflammatory. For after making allowance for the sources of fallacy necessarily attending such observations, we may assert that experience has fully established the following points.

1. That in the strictly inflammatory diseases, evacuations of blood are of the utmost use in the early stages, all other remedies comparatively inefficient, and stimulant remedies decidedly hurtful in all but the latest stage.

2. That in the cases described as idiopathic fever, even although symptoms of local inflammation be present, the amount of evacuation which it is safe to practise on ac-

count of these is much less than in the former case; that
its beneficial effect is less decided,—the local symptoms
being seldom so effectually subdued, and the general, es-
pecially the typhoid symptoms, being seldom improved, and
sometimes evidently aggravated by loss of blood; that the
tendency to a spontaneous favourable termination is much
stronger; and that even when indications of recent local
inflammation exist, decided benefit may often be obtained
from the use of stimulants, under which the pulse may im-
prove, and the typhoid symptoms of general fever abate,
without the local affection being materially or even per-
ceptibly aggravated.

It is also ascertained by sufficient experience, that the
inflammatory symptoms are more urgent, and evacuations in
general much better borne in some epidemics of continued
fever; and that in others the indications of debility of the
vascular system are more permanent, and stimulants more
generally useful; while no such differences are observed as
to the strictly inflammatory diseases in different seasons.

These statements seem sufficient to shew, that it is a limit-
ed and hasty view of the phenomena and history of Fevers,
which has suggested the opinion of their being resolvable
into the constitutional effects of the Inflammations, or local
determinations and congestion of blood, which can be ascer-
tained to attend them; and that we may now safely apply
the term Idiopathic as expressing the belief of an essential
distinction existing between these fevers, and those that
were formerly described as resulting from local inflamma-
tion.

At the same time, the strong similarity or coincidence in
many respects, of the essential symptoms of the symptoma-
tic and the idiopathic fever, must always be regarded as a
leading fact in reference to the pathology of the latter.

But in idiopathic fever, not only is a diseased action
excited throughout the system, similar to that which lo-
cal inflammation can excite, but the system is at the same
time under the influence of a cause, which acts on it nearly

after the manner of a Poison; which we know, from the
history of the disease, to be probably engendered occasion-
ally within the system itself, but to be more frequently ab-
sorbed from without; and which takes effect, as poisons do,
only for a time, and then loses its power. In regard to
this morbific cause, which both excites and gives the pe-
culiar character to, the febrile actions, several questions
present themselves.

I. It may be questioned, whether the effect on the Ner-
vous System, essential to fever, is produced directly by the
external cause of fever, or whether that cause first works a
change on the blood, and through its intervention affects
the brain and nerves.

It is plain, that the blood is changed, at least as to its
power of coagulation, in most cases, and perhaps it may be
so in all cases of idiopathic fever. But a similar change as
to that property may be produced in it, by causes acting in
the first instance on the Nervous System; and this fact,
therefore, does not indicate the part of the system which is
primarily affected in fever.

Reasons which appear satisfactory may be given against
the supposition of many of the older pathologists, that fever
essentially and exclusively *consists* in a certain change in
the blood (quæ præsens morbum facit, sublata tollit, mu-
tata mutat); and in particular, two facts already stated
seem decisive against that theory, viz. 1. That after the
morbific cause has been applied to the blood, it may de-
pend, as we believe, on causes acting on the Nervous Sys-
tem only, whether or not it shall produce its specific ef-
fect; and 2. That even after that specific effect has been
produced, and the febrile actions begun, they may, in a few
instances, be arrested by means (such as the cold affusion)
which neither evacuate any part of the blood, nor alter its
composition.

But it may still be thought, that the remote cause of
fever does not produce its effect by merely once impressing
the Nervous System, or other living solids; but that it

must necessarily circulate for a time in the fluids of the body, and perhaps multiply itself in them, in order that it may take effect on the solids. And in favour of *this form* of the humoral pathology of fever, the following facts may be stated.

1. In a great majority of the cases in which we see typhoid fever, we are sure that some peculiar matter, generally absorbed from without, must be contained in the blood; as in the case of fever from malaria, from contagion, (whether of simple fever or the eruptive fevers) from inflamed veins, from animal poisons introduced by wounds, or from suppression of the natural excretion at the kidneys.

2. In all cases of idiopathic fever, as well as of the eruptive fevers, an interval, which is variable and often long, necessarily elapses between the application of the morbific cause, and the development of the fever; which is easily understood on the supposition that a change is gradually wrought on the blood during that interval, but not on the supposition of the poison acting simply on the living solids.

3. In a great majority of cases of typhoid fever, we know that a matter, similar in its effects on the human system, to that which excited the disease, is ultimately evolved in large quantity from the blood, making the disease contagious; *i. e.* the morbific poison in one way or another is multiplied in the blood of the living body.

It has been naturally supposed, by pathologists at different times, that the frequent and rapid abatement of fevers, after critical evacuations, is farther proof of the doctrine of their cause residing chiefly in the blood; and that this morbific cause is really carried off by these evacuations. And in support of this opinion, it has been stated, that when putrid matters, or diseased secretions, have been injected into the veins of animals, and excited febrile symptoms, a peculiarly fetid diarrhœa has preceded the recovery from these.

But when it is considered, 1. That copious or spontaneous evacuations (*e. g.* of sweat) at the critical periods of

fevers, often take place without the least good effect, if un-attended by other marks of restoration of the natural condition of the capillaries ; 2. That many fevers abate spontaneously and perfectly without crisis ; 3. That the evacuation of poisons (*e. g.* of narcotic poisons) from the body, is not necessary to the removal of their effects ; 4. That in all contagious diseases, morbific effluvia escape for a long time from the body, without any good effect ; 5. That there is no evidence of the critical evacuations possessing more contagious property than the effluvia which continually escape without advantage; and *lastly*, that in smallpox in particular, experience has shown, that the morbific matter in the pustules may be evacuated as quickly as it appears, without benefit, and may be reabsorbed into the blood without injury ;—we can hardly suppose the critical evacuations to be the *cause* of the solution of the fever that succeeds them ; and must rather regard them as the *sign* of the restoration of the natural state of the vital actions in the capillaries of the body; whereby the excited action of the heart is enabled to throw off an unusual quantity of secretions and excretions, and then subsides ; because the cause confining the circulation, and therefore stimulating the heart, has ceased to operate.

The doctrine of the existence of a morbific matter in the blood, therefore, is not supported by the facts as to the critical evacuations, but must be rested on the other facts above stated.

II. Whether the morbific cause first alter the fluids or not, it is evident that it affects the actions of all the living solids, whenever it excites fever; and it may be questioned, whether the first effect of the morbific cause is exerted on the Nervous or on the Vascular system. Besides what was formerly said on this point in treating of symptomatic fever, (p. 441.) the following reasons may be given for suspecting that the first action of the cause of idiopathic fever is on the nervous rather than the vascular system.

1. The nervous system is evidently more affected through-

out the whole series of morbid actions, than in the former case, and the first symptoms by which the idiopathic fever can in general be recognised, are strictly affections of the nervous system.

2. We have seen (p. 330.), that when inflammation co-exists, in the living body, with the effect of a violent con-cussion of the brain and nerves, the fever that it excites has quite the typhoid character.

3. We have good reason to believe, that changes taking place unquestionably in the nervous system, viz. those which attend mental emotions of sufficient duration and intensity, if they have not power (as it may reasonably be conjectured, that in certain circumstances they have) to generate fever, have at least such an influence on its causes, as to determine their efficiency or inefficacy in individual cases; which is of itself a strong presumption in favour of the belief, that the primary action of these causes is on the nervous system.

4. Besides these mental emotions, there are various other agents, formerly noticed as concurrent and accessory causes of fever, and by which we have reason to think, that the development of fever, after the poison has been imbibed, is often determined,—e. g. cold, muscular exertion, and intoxi-cating liquors; and the chief action of all these causes also is on the nervous system.

5. There is at least one remedy, of peculiar efficacy in counteracting the agency of one of the causes of fever, i. e. the Cinchona, which produces no visible effect on the vas-cular system, and the action of which there is reason to be-lieve, from what we see of it in other cases, to be on the ner-vous system.

But whatever be the mode in which the morbific cause, in Idiopathic Fever, comes to affect the circulation, it is to the direct action of this cause, and not to the influence of any local diseased actions, excited in the body, that we must ascribe the enfeebled state of the circulation,—the al-tered state of the blood,—the peculiarly vitiated state of the secretions,—and in a great measure also, the deranged state

of the nervous system,—which were described as character-istic of Idiopathic, and especially of Typhoid Fever.

And there is nothing absurd, or inconsistent with what is known of the action of poisons, or of other agents on the animal economy, in supposing that the morbific cause, af-ter existing some time, and perhaps multiplying itself, in the fluids, *may act simultaneously* on the constitution of the blood, on the powers of the heart, on the vital affinities in the capillary vessels, and the vital actions of the brain and nerves.

We have good reason to think, that it is especially by its action (whether direct or indirect) on the vital changes in the capillary vessels, that this cause excites the symp-toms which were described as characteristic of Fever; and we refer to the account given of fever symptomatic of in-flammation, for the explanation of the manner in which the different steps in the series of changes constituting febrile action, consequent on that deficient vital action in the ca-pillaries, are connected together.

But the peculiar depressing action of the morbific cause on all the parts of the system above mentioned, appears from what has been said, to be perceptible throughout idio-pathic, as distinguished from symptomatic fever; and it is easy to understand, that its effect on any one of these may become so intense, as to be dangerous. The sedative effect on the heart is often such as to enfeeble, and sometimes such as nearly to suppress, the febrile reaction, as in Con-gestive Fever; that on the brain may produce fatal coma, as in some cases of Nervous Fever, independently of any effusion or organic lesion in the brain; that on the vital functions of the capillary vessels may be such, and so long continued, as to cause fatal inanition and exhaustion, as in some cases of Fever, fatal merely by reason of the long endurance of the disease, without failure of the functions of any one organ in particular.

In most cases of fever, however, the danger is not pro-duced solely in this way; but appears manifestly owing to a *combination* of the enfeebled state of the circulation, with peculiar derangement of the functions of individual

organs, consequent on the attendant inflammations there, the symptoms and post-mortem appearances of which have been already described. In consequence of this combination, we have three distinct modes of fatal termination of fevers, which are often blended together, but in some cases are quite separate and easily distinguished; and which are clearly illustrated by the different kinds of sudden or violent death formerly described,—and by what has been said above of the morbid appearances left by fatal fevers. These are, 1. The death by *Coma*, referable partly to the peculiar action of the cause of fever on the brain, but partly also to increased determination of blood thither, or inflammatory action or effusion there ; 2. The death by *Asphyxia*, referable partly to the enfeebled state of the circulation, and want of power in the heart to propel the blood through the lungs, but partly also to Bronchitis or Pneumonia. 3. The death by mere *Asthenia*, referable partly to the deleterious effect of the morbific cause on the circulation, but partly also to various local inflammations, prolonging the febrile state ; and especially to the inflammations and ulcerations in the mucous membrane of the intestines, which appear to have in this, as in other cases, a peculiar sedative, and what was formerly designated as a sympathetic, effect on the heart's actions.

It was already stated, that these inflammations during the state of fever, are so far influenced by the altered condition of all vital actions in the capillary vessels at that time, that the local effects which they produce differ materially from those which follow inflammation of the same parts in a system free from general fever ;—as is seen, *e. g.* in watching the progress of a parotid, or other external abscess, commencing during the febrile state, but only suppurating fairly when that state has subsided. Nevertheless, the internal inflammations often attending fever are quite sufficient, when their effect is combined with the generally enfeebled state of the circulation, to cause great danger.

The nature of the connexion between these local inflammations and the general fever is often obscure. In many

cases they are evidently produced by a different cause, (chiefly cold applied before the onset, or during the course of the disease), and only accidentally combined with the fever ; but in other cases they may probably be regarded as effects of the general fever. The determination of blood to the head, and consequent slight inflammation and effusion, seem often to be of this description, and are analogous to what sometimes happens in inflammatory diseases of other organs than the head. The reproduction, in any part of the body, of inflammatory action which has recently sub-sided there, appears to be an effect, rather than a mere accompaniment of fever. And the peculiar inflammation of the mucous glands and membrane in the intestines, when it takes place late in the disease, may be suspected to depend very much on the bile, and other irritating contents of the intestinal canal, passing over a membrane, which in consequence of the feeble circulation, the blunted sensation, and the deficient secretion, has lost much of its natural protecting mucus ; and to be analogous to the inflammation of other mucous membranes, consequent on section of their sensitive nerves, (p. 114), and to that which precedes death by starvation (p. 178).

On this supposition, inflammations of the mucous membrane of the intestines, occurring towards the close of protracted fevers, will stand in nearly the same relation to them as the inflammation, ulceration, and gangrene, from pressure on external parts ; which are very common, and often constitute a great part of the danger in such cases.

These relations between idiopathic fever and the concomitant local inflammations are of great practical importance; and the chief difficulty and nicety in the treatment of fever, lies in determining, how far the danger depends on such local affections as demand evacuations, and how far on the effect produced on the system by the morbific cause, which will often spontaneously abate, and often demands remedies of the opposite class.

CHAPTER VIII.

OF CONTAGIOUS EXANTHEMATA.

We here treat of those diseases, caused chiefly if not solely by contagion, and therefore prevailing at times epidemically, in which there are symptoms of general fever, more or less of the typhoid character,—and at the same time an eruption on the skin, (as in many cases of continued fever already described); in which there is very generally likewise inflammation, chiefly of the mucous membranes, in internal parts; and the danger appears to de‧ pend, seldom on the extent of inflammation on the surface, but partly on those internal inflammations, and partly on the affection of the general system, and especially of the circulation, which results from the action of the morbific cause. There are these material differences from continued fever, that the duration of the febrile action is shorter, and much more uniform, and that the whole succession of the symptoms, and especially the course of the external inflammation, is much more regular. This description applies chiefly to Smallpox, Measles, and Scarlatina, and probably also to the Plague. It applies also to the slight disease called Varicella; and, in several important particulars, to the Erysipelas.

The Pathology of these diseases, and especially of the combination existing in them all, of local inflammation, always of a peculiar or specific character, with general typhoid fever, is essentially the same as that of continued Fever; but it is important to state shortly, how far the statements made as to the history of continued fever are applicable to each of these exanthematous diseases.

I. As to the cause of these diseases. In the case of smallpox, measles, and plague, we are nearly certain, from facts of

the description formerly noticed (p. 361.) not only that these diseases are contagious, but that they never proceed, at the present day, from any other cause than the specific contagion, thrown off probably chiefly in the breath of persons themselves affected with the diseases, but likewise existing in the excretions formed on the surface of their bodies, as appears from the communication of the diseases by inoculation. But it is more doubtful whether the scarlatina and varicella (of which a few cases occur almost every season in this country, and which seldom spread epidemically to any great number of persons), do not occasionally arise from unknown causes, and then spread by contagion; and of the frequent sporadic origin, and only occasional communication by contagion, of the erysipelas, there can be no doubt.

In this last case, it seems nearly a necessary condition to the communication of the disease by contagion, that an inflammation of the skin, or at least an abrasion of the cuticle, whether by wound, bruise, scratch, blister, or some other cause, should exist at the time that the morbific poison is presented. It has also been supposed that some derangement of the digestive organs is an essential condition to attacks of erysipelas, but it does not appear ascertained that such derangement does more in this than in various other cases of exposure to the causes of acute disease, viz. strongly predispose to their development.

The protection against future returns of the disease given by its once taking place, which was mentioned as frequently observed in regard to continued fever, is nearly absolute in the case of smallpox, measles, scarlatina, and probably varicella; though a few exceptions to the rule have been observed in all these cases; but it does not hold so surely of plague, and the reverse appears to hold of erysipelas.

The singular and anomalous facts as to the connexion of smallpox and cowpox may be thus stated, That the contagious matter of smallpox may be so applied as to act on the living system of the horse and the cow *, and excite in them a mild vesicular disease, without any general erup-

* See Edinburgh Medical and Surgical Journal, 1831.

tion, and without constitutional disturbance; and that this local vesicular disease, communicated to the human subject by inoculation, runs its course there in the same innocent manner; with the effect of protecting the system, in a great majority of cases, against all subsequent influence of the contagion of smallpox; and with the effect, in almost all the cases, where the protection given by it is not absolute, of so modifying the disease which that contagion can excite, as to arrest the progress both of the cutaneous inflammation and of the fever, about the end of the first week, and so render it nearly free from danger.

The contagious poison of all these diseases, like that of continued fever, is liable to great variations,—in efficiency, as seen in the diffusion of epidemics,—in virulence, as seen in their mortality; and in specific character, as seen in the most urgent symptoms, and most frequent accompaniments of the diseases, as occurring in different seasons.

II. As to the chief symptoms of these diseases. In all there is so distinct an eruptive fever, although of various duration, before the inflammatory appearances in the skin commence, as unequivocally to demonstrate that the inflammation, although an effect, and the only sure criterion, of the specific poison which excites the fever, is not the cause of the fever; which must therefore be held, like Idiopathic Fever, to consist in the reaction of the system against the depressing influence of the specific poison. The internal inflammations attending these diseases, although often aggravated by the usual causes of inflammation, applied at the time, are yet so uniformly observed, and so frequently severe when there has been no such concurrent cause, that we must regard them as likewise effects of the specific poisons.

The Smallpox is distinguished by the pretty uniform duration, both of the latent period (from seven to twelve days), and of the eruptive fever (from thirty-six to sixty hours); and by the pustular character of the eruption, the suppuration of which is not completed till the seventh or eighth day from the appearance of inflammation, and, when the erup-

o *

tion is numerous, is followed by secondary fever for some
days more. In this disease the peculiar action of the conta-
gious poison on the Nervous System is often shewn, in the
case of children, by convulsions before the eruption comes
out. The fever is seldom attended with so great depression
of the circulation, as is seen in the more malignant cases of
other epidemic diseases, and the disease is very generally
protracted at least until the usual time for the maturation
of the pustules; but when their number is very great, the
powers of the system are inadequate to the filling of the
vesicles that had formed in the skin, or to the conversion
of the fluid in them into pus. The mucous membrane of
the fauces is very generally inflamed early in the disease,
and that of the trachea and bronchiæ, in a greater or less
degree, in the later stages. The substance of the lungs like-
wise often undergoes changes similar to those described as
occurring there in Fever. The mucous membrane of the sto-
mach and bowels is more rarely and more variously affected.

In Measles and Scarlatina, the duration both of the la-
tent period, and of the eruptive fever, is less uniform.
These diseases are distinguished by the peculiar appearance
of the cutaneous inflammation, which seldom lasts above
four days, and leads to no result in either, except desquama-
tion, and in the scarlatina, separation of the cuticle in
large patches. The constitutional fever resulting from the
specific poison,—very generally of shorter duration than
that of smallpox, is remarkably various in character in dif-
ferent cases, and also, on an average of cases, in different
epidemics. In many of the worst cases of scarlatina, and
in some of those of measles, it has quite the form of the
adynamic, or even of the *congestive* fever formerly describ-
ed, (p. 436.), *i. e.* fever with feeble and imperfect reaction.
In such cases, the peculiar action of the poison on the ner-
vous system shews itself generally by much nausea and vo-
miting; and the inflammation on the skin is pale or livid,
partial, and of short duration.

The internal inflammations attending these diseases are
much more uniform than in smallpox; viz. in Measles, in-

flammation of the tunica conjunctiva and mucous mem-
brane of the nose in the eruptive stage, soon succeeded by
bronchitis, or even by peripneumony (which sometimes be-
come aggravated after the decline of the eruption), and oc-
casionally succeeded by inflammation of the mucous mem-
brane of the bowels;—in Scarlatina, inflammation, often
tending to ulceration in the tonsils, attended by swelling of
the neighbouring lymphatic glands, and also by inflamma-
tion of the mucous membrane of the nostrils, sometimes
followed likewise by extension of the inflammation to the
trachea and bronchiæ.

In Plague, the fever and external inflammation appear
at irregular times after the presumed exposure, but gene-
rally within a few hours of each other. The latter consists
of spots of inflammation, running rapidly to gangrene, and
of buboes or swellings of lymphatic glands, rapidly increas-
ing but rarely suppurating. The fever is very generally
of the character to which the name of Congestive has been gi-
ven, i. e. the reaction is very imperfect, or hardly observed,
and the chief symptoms may be said to be an aggravated
degree of those which take place in the commencement of
all the contagious febrile diseases, weakness of pulse and of
voluntary muscles, paleness, nausea, and vomiting, stupor
or confusion of thought approaching to stupor, and tre-
mors. There is no good evidence of any internal inflamma-
tion frequently attending this disease.

In Erysipelas, the eruptive fever is of various duration,
but seldom lasts more than three days. The inflammation
is extremely various, both in extent and duration;—it is
characterized chiefly by its rapid spreading along the sur-
face, and its tending to vesication and to desquamation
externally, and often to suppuration (chiefly of the diffuse
kind) within the true skin. Symptoms threatening inflam-
mation of the brain often supervene on, or follow the rapid
recession of, erysipelas; and inflammation of the fauces
and larynx very often attend it. The accompanying fever
is very various, sometimes strictly inflammatory, often
more or less typhoid, and sometimes of the character called

congestive; and in those last cases the inflammation is often apparently slight, its colour livid, and its local effects inconsiderable.

III. As to the mode of fatal termination of these diseases. It is obvious from what has been stated, that the danger in them, as in continued Fever, will generally be complex, and widely different in different individual cases of the same species,—sometimes dependent chiefly on the malignant character of the typhoid fever, i. e. on the virulence of the morbific poison,—sometimes on the intensity of the local, and especially the internal inflammations; and that the nicety of practice will consist in so balancing between these dangers, as to apply in each individual case the remedies best adapted to that, which is there the greatest.

In Smallpox, the chief danger is of death by mere exhaustion or asthenia, generally attended with much comatose tendency, to be expected at the period of maturation of a very copious eruption, which is always attended with a somewhat typhoid fever, and suppurates very imperfectly. But there is also, in many cases, a great aggravation of the danger, from the hurried and laborious breathing consequent on the Laryngitis, Bronchitis, or even Peripneumony, which take place in the later stages of the eruption; and in some cases the affection of the air-passages is such as so cause death by asphyxia, even when the eruption is distinct, and its maturation pretty complete. But the inflammation in these parts, while the smallpox lasts, hardly ever goes on to any other termination than thickening of the membrane, and increased mucous or muco-purulent secretion in the bronchiæ; nor is it to be expected that it can subside completely, until the period of the decline of the eruption.

In most epidemics of Measles, the danger is merely from the accompanying bronchitis, and from this chiefly about or even after the time of the decline of the eruption. But it is probably always more dangerous as occurring in a system which is under the influence of a weakening febrile

disease independent of itself; and there are occasional epidemics of measles, and a few cases in ordinary epidemics, where the malignant typhoid fever is evidently very dangerous, even independently of the complication with bronchitis; but of course much more so if that inflammation is at the same time such as to threaten death by asphyxia.

In Scarlatina the danger is more various than in any of the others. In a few cases it depends on the amount of swelling in the fauces in the early part of the disease, or on the early extension of the inflammation to the larynx, threatening asphyxia. In many cases of the kind called Malignant, it depends simply on the depressed state of the circulation in the typhoid fever; in a number of others, where the eruption has been florid and persistent, and the fever originally not malignant, it depends very much on the inflammation of the lymphatic glands around the fauces, which then supervenes on the ulcerated state of the tonsils; and on the aggravation, and generally the more typhoid tendency, of the fever in that stage. When all these dangers are over, there is more risk of subsequent inflammatory affections after this than after any of the other eruptive fevers.

In Plague, the danger, although probably sometimes aggravated by the local inflammations, is obviously chiefly dependent on the direct depressing influence of the specific poison on the brain, and especially on the heart.

In Erysipelas, the danger sometimes depends on the extent to which the inflammation goes in the skin and cellular membrane, and the exhausting processes of suppuration and sloughing that succeed; sometimes on a simultaneous inflammatory affection of the brain, or a metastasis of the inflammation thither; sometimes on a concomitant inflammation of the fauces and larynx ; but often it depends in part, and sometimes entirely, on the enfeebled state of the heart, and general typhoid form of the constitutional fever.

In all the Eruptive Fevers except this last, it is to be observed as an important part of their Pathology, that experience has proved the inutility and danger of attempting to arrest the course of the specific inflammations of the skin, after they

have commenced. Whether the body contain in it a morbific poison which should be expelled or not, it certainly labours under the influence of a cause, which is most dangerous when any inflammations, that may coexist with it, are abortive; and the unwonted recession of the inflammation, if not a *cause* of injury, is very generally to be dreaded as a *sign* of intense action of the morbific cause on the circulating system, and impending death by asthenia. But in the case of Erysipelas, no such consequences follow the use of remedies which subdue the external inflammation when urgent; and although there are other dangers, in many cases of the disease, which demand very different remedies, yet in so far as danger appears to threaten from the extent and intensity, and probable consequences, of the inflammation on the surface, experience shews that the antiphlogistic remedies, and especially the local detraction of blood, may be used with safety and great advantage to avert it. In this important respect, as well as in prevailing less epidemically, and following a much less regular course, than the other eruptive fevers, the erysipelas may be said to occupy a middle ground between them and the simply inflammatory diseases.

Immediately after the cessation of the eruptive fevers, as well as of continued fever, the system is peculiarly liable to inflammatory attacks, sometimes hardly to be distinguished from the last symptoms of these diseases themselves. This is peculiarly the case about the time of the desquamation succeeding scarlatina; at which time also, and often in combination with such inflammations, a dropsical affection afterwards to be considered, is very apt to occur.

CHAPTER IX.

OF DISEASED STATES OF THE SECRETIONS.

It has been already said that increase or alteration of the vital changes taking place in the capillary vessels, is often the cause, and often also the effect, of increased determinations, or altered distribution of the blood; that Inflamma-

tion is, in several instances, attended with increase and al-
teration of exhalations and secretions already existing, and
always tends to a change of the products formed from the
blood at the part which it affects; and that a general di-
minution and alteration of the products formed from the
blood, is an essential, and probably the most fundamental,
part of the changes that constitute Fever.   It is therefore
obvious, that no distinct line of demarcation can be drawn
between the diseased actions already considered, and those
of which alteration of Secretions, and of Nutrition, are the
most essential constituent.

But there are many diseases in which these vital ac-
tions in the capillaries are much and primarily altered,
and in which there is in general, and especially in the
commencement, neither fever excited, nor any of the usual
products of inflammation formed, nor even any such con-
gestion of blood effected, as is in itself injurious ; which we
must ascribe, therefore, to alteration or *perversion* of the
functions of Secretion, Exhalation, and Nutrition, and of the
concomitant function of Absorption, by which the condition
of all extra-vascular parts within the body is determined;
and these diseases come next under our view.

It is not to be expected that we can *explain* these altera-
tions of vital actions, which are, in their natural state, so
very imperfectly understood; but it is necessary to have some
arrangement of them, and to state what is known of their
causes, and of their connexions with other diseased states.

In a brief outline of this subject, we set aside the cases
already considered, of altered secretions dependent on de-
cided inflammation, and on fever ; and also the case, after-
wards to be shortly noticed, of diseased secretions depend-
ing on morbid alterations of the blood from known causes.

In regard to the whole of the classes of disease now to be
considered, it is to be observed that they are generally of
much longer continuance or more frequent recurrence than
inflammatory and febrile diseases, and that their abate-
ment, by a natural process, is less to be expected.

It is important to distinguish, in treating of the diseased

states of the secretions, those which have been described as Recrementitious, from those destined to Excretion; but it is to be remembered that the Bile, and perhaps others of the secretions of the primæ viæ, appear to partake of the nature of both classes of secretions.

I. The most important disorders of the first class of Secretions, are the affections of the secretions of the Primæ Viæ concerned in digestion. From a simple increase of these arise Ptyalism, Cholera, perhaps in some cases Bulimia, and Diarrhœa of different kinds (often independent of any inflammatory action, as appears from its whole history, and from the appearances seen on dissection after it) *. And from alteration of them arise the varied forms of Dyspepsia, (the symptoms of which are dependent, partly on deficiency of the natural sensations which attend the healthy state of the secretion at the stomach, and partly on morbid sensations, and sometimes morbid actions, consequent on the delay and the imperfect solution of the food); an occasional diseased state of the mucous membrane of the bowels, in which morbid, viscid, or ropy mucus is thrown off, without inflammatory symptoms, and without diarrhœa; another diseased state of the secretion of the mucous membrane, in which much phosphate of lime is thrown out, forming the basis of intestinal Calculi; different diseased states of the stomach and bowels, consequent on the flow of defective or vitiated Bile; Jaundice, when, from inspissated bile, or from gall-stones (the symptoms of which depend partly on the absence of bile from the intestines, and its presence in the blood and in the urine, partly on the sensations resulting from the immediate action of the cause that obstructs its descent, and partly on the imperfection of the process of digestion when it is absent); and constipation or Colic, commonly dependent on the deficiency of the natural stimulus to the intestines, and consequent accumulations and uneasy sensations there.

These diseases of the organs of digestion are, in a few

* See ANDRAL, Clinique Medicale, t. i. p. 424.

cases, dangerous, in like manner as inflammation of these organs, by reason of the sympathetic effect on the heart (as in the cases of violent Gastrodynia attending indigestion, or of violent Cholera) ; sometimes they are dangerous, by reason simply of the gradual wasting and exhaustion consequent on them ; but more frequently they are dangerous by so weakening the system, as to give a strong predisposition to, and aggravation of, other diseases, whether inflammatory or organic, with which they become complicated.

Again, there are cases of chronic cough and asthma, dependent on increase and alteration of the natural mucous secretion of the bronchiæ, which cannot be said to shew any indications of inflammation,—particularly that variety where much pale ropy mucus is expectorated ; and there are many cases of chronic diseases of the skin, even such as Lepra, Impetigo, &c., still more such as Ichthyosis or Molluscum, during the greater part of which there are no marks of inflammation, and which may be considered as consisting in morbid secretions on the true skin ; and accordingly, when these are affected by remedies, it is by remedies of the class of alteratives, not by antiphlogistic measures.

Now, in regard to diseases thus depending essentially on altered Secretions, we observe, that although their causes are often obscure, yet the following are often observed to act, and may often be avoided or averted.

1. They depend often on the application of external agents of the same kind, but short in degree of those which can excite inflammation of the parts. Thus mercury excites ptyalism, heat cholera ; alcohol, or other stimuli, or any aliments very difficult of digestion, or in excessive quantity, in their secondary operation, lessen and injure the secretion at the stomach ; many kinds of food or drink produce diarrhœa ; and sometimes exposure to cold excites either dyspepsia or diarrhœa, without any appearance of inflammation.

2. They are often the result of changes taking place in the condition of the Nervous System, the peculiar influence of which on the secretions has formerly been illustrated; as

when long continued mental languor or depression, or more violent mental emotion lessens, and probably vitiates, all the secretions of the primæ viæ, and causes dyspepsia, constipation, diarrhœa, sometimes jaundice, according to the constitution of individuals;—when mental emotions so injure the secretion of milk as to make it poisonous to the infant;—or when the sensation of intense pain in any part of the body causes thirst or dryness of the mouth, and destroys the power of the secretion at the stomach. A still more striking case of this kind, if we can regard it as duly authenticated, is the supposed effect of violent rage, pain, and terror, in so altering the secretions of the mouths of animals, as to make them capable of communicating by inoculation the true Hydrophobia.

3. They are often produced by deficiency of the natural stimuli of fresh air, exercise, and variations of external temperature; which privations may be supposed to act, partly by producing long continued irksome sensations, and partly by repressing the circulation on the surface, and the different excretions from the body, and so favouring plethora in internal parts.

4. They are often *sympathetically* produced by diseases, functional or organic, of other parts of the system; as when various disorders of the stomach ensue in the course of diseases of the brain, liver, bowels, kidneys, uterus or other pelvic viscera. According to what has formerly been stated as to sympathies, this influence of the diseases of distant parts may be believed to take place through the intervention of long continued uneasy sensations resulting from these diseases, and therefore may be resolvable into the second head of the causes of diseased secretions.

5. Although not necessarily dependent on any alteration of the usual state of the circulation, yet in many cases they supervene on, and in others they give rise to, congestions of blood in the parts where they take place; and in both cases they are aggravated by such congestions of blood; as is obvious when we observe the facility with which Dyspepsia or Diarrhœa often supervenes on obstruction to the

flow of venous blood through the liver; or the manner in which dyspepsia or diarrhœa often assumes somewhat of the character, and is relieved by a moderate use of the remedies, of inflammation of the stomach or bowels.

This is remarkably observed in certain forms of dyspepsia in adults, described by Dr WILSON PHILIP, Dr PARRY, and others, in this country, and by BROUSSAIS and his followers in France; and again, in many cases of the Febris Infantum Remittens; which does not always imply, but often threatens, or even passes into, inflammation of the mucous membrane of the bowels.

It is farther important to observe, in regard to these alterations of secretions, that they produce, and frequently make themselves known by, not only derangement of the functions in which they are themselves concerned, but likewise derangement of other functions, often of distant parts; and that in two ways,—either when the function secondarily affected is necessarily dependent on that first deranged; —or else in a more precarious and variable way, when the affection of the second is truly a sympathetic change.

Thus a disordered state of the function of digestion, or habitual constipation or diarrhœa, leads naturally to deficient nutrition, and to debility and emaciation; and it also leads much less certainly, but sometimes more obviously, to a distempered state of the external senses, particularly vision,—or of the mental faculties (Hypochondriasis), —or of the respiratory actions (Asthma),—or of the voluntary muscles (Hysteria, or even Convulsion),—or to various indefinite uneasy sensations common in persons of *nervous* temperament, &c.; or modifies the progress of inflammation, especially if scrofulous, or of any other local disease that may be excited in the body, rendering it more obstinate, and less amenable to treatment, as has been well illustrated by Mr ABERNETHY, Dr HAMILTON senior, and others. In children, febrile action is frequently excited by derangements of the secretions of the Primæ Viæ, independently of inflammation; and in certain (chiefly scrofulous) constitutions, this fever is very apt to pass into Hydrocephalus.

The spasms of the legs, which attend violent diarrhœa or cholera, are an example of a more definite and uniform sympathetic effect, resulting from the state of the secretions of the primæ viæ.

II. The Excretions from the body are very liable to increase, diminution, or alteration, from the same kind of causes which act on the other secretions; and are sometimes totally suppressed, with injurious or even fatal effects, but independently either of fever, inflammation, or change of texture of the parts furnishing them.

Thus the Menstrual Flux is often increased and altered (as by the establishment of permanent leucorrhœa) from a luxurious or debilitating mode of life, from mental emotions, or from exertions especially affecting these parts; and again, it is liable to sudden suppression from cold; and in both cases, many sympathetic affections of the stomach, of the heart, and of the nervous system, usually follow. And the Urine is liable to alteration from the nature of the ingesta, from cold or heat, from affections of the nervous system, as in Hysteria, from injuries in the neighbourhood of the kidneys, &c.; and it is occasionally totally suppressed without a known cause.

But from what has been formerly said of the manner in which the peculiar matters of the excretions are probably prepared in the blood before it enters the excretory glands, (p. 52.), and also of the necessity which exists for the evolution of certain matters by these means, from the system, it may naturally be expected, 1. That the excretions may be affected by a disordered state of the functions of different and distant parts; and, 2. That more pernicious effects (consequent on the retention of noxious matters which ought to be expelled), may result from their alteration or suppression than from similar affection of the other secretions. And although the subject is very imperfectly understood, illustrations of both these points may be given.

Thus the Menses are often suppressed, not in consequence of causes acting peculiarly on the uterus, but in con-

sequence of mental emotions, or general sensations, such as cold, or of any cause of general weakness, of long duration.

The two most important alterations of the urine (unconnected with organic disease of the kidneys) are, its tendency to deposit different kinds of earthy deposits in Gravel; (some of them, the uric acid and the phosphates, natural constituents of the urine, others, as the oxalate of lime and the cystic oxide, new combinations of the elements composing it); and its great increase, both in quantity and specific gravity, and the alteration of its animal matters, in Diabetes. The former of these appears, from the other complaints attending it, and from the juvantia and lædentia, to be very dependent, if not on the nature of the ingesta, at least on the condition of primæ viæ, and the nature of the supplies sent from thence to the blood,—rather than on any cause acting directly on the kidneys.

The Diabetes is certainly not a disease confined to the kidneys, nor *chiefly* seated there; because it is often found unconnected with any lesion of the kidneys; and because this remarkable fact is very generally observed in it, that shortly before death the urine becomes quite natural both in quantity and quality. From what we now know, of the appearance of Urea in the blood when its evolution at the kidneys is obstructed, it is reasonable to infer, that the great increase in the quantity of urea, and its conversion into sugar in diabetes (by the change in its constituent elements noticed at p. 90) will be effected at all parts of the body where the formation of urea is begun; and from what was formerly said of the great probability of this substance, destined only to excretion, being a product of absorption, it may be supposed that its formation is begun wherever absorption takes place.

Accordingly it may be observed, that the symptoms seen in Diabetes, (in addition to the increase of the urine), the thirst, the keen appetite, the dryness of the surface, the general wasting, and ultimately extreme debility, notwithstanding the great amount of ingesta, are all indications of unnatural activity of Absorption; from which it seems

probable, that first an increased formation of Urea, and then a formation of sugar, (from the same elements, with the exclusion of azote, and an additional proportion of carbon and oxygen), may naturally result.

Again, it was formerly stated, that the different consequences frequently resulting from suppression of the Menses, hæmorrhages often in unwonted situations, inflammations, and various nervous affections, appear to be more serious than what usually result from stopping a slow hæmorrhage of an equal amount. And it is certain that when the excretion of Urine is suppressed, the consequences are such as clearly indicate the action of a poison on the body, viz. Nervous symptoms resembling those of typhoid fever, and ultimately fatal Coma.

It may be observed here, that these consequences follow suppression of the excretion at the kidneys, but do not necessarily follow a great amount of absorption of urine from the bladder or ureters; for cases occur where, in consequence of obstruction at the ureters or bladder, great and long continued distention of the ureters, and great absorption from them, are found to have taken place, without any such consequences having followed.

It would appear that the same principle applies to the secretion of Bile, for although long continued *obstruction* to its descent from the gall-ducts, and consequent absorption of it into the blood, are often borne with impunity, yet in those cases where its secretion at the liver has been *suppressed*, and the ducts have been found on dissection pervious and empty, fatal coma has in general quickly supervened on the jaundice *.

The rapidly fatal effect of suppression of the excretion by the Lungs has already been fully considered. The suppression of excretion at the Skin is seldom effected, and when it is, its bad effects may probably be averted by increased exhalation of the same matters at the lungs. But the peculiar liability to inflammatory affections, and to dropsy,

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* See MARSH in Dublin Hospital Reports, vol. iii. Several cases in all material respects exactly similar, have occurred to myself.

while the skin is in an inert state after exanthematous diseases, particularly scarlatina, may be partly owing to the retention of this excretion.

A febrile attack very generally succeeds the sudden suppression of the secretion of Milk; but is of short duration, probably because the conditions necessary to the continuance of that secretion (see p. 304) soon cease to exist.

In regard to all morbid states (at least to diminution and alteration) of secretions in the body, it is to be observed, that they will naturally be more apt to take place in secreting organs which have undergone any organic change of structure than in others; and therefore that when strongly marked and obstinate, these changes in the secretions are often connected with, and may generally excite suspicion of, such organic lesions as are next to be considered.

In connexion with these disordered states of the Secretions, a few words may be said of the pathology of the new and anomalous disease, which is essentially characterised by a very diseased condition of almost all secretions, viz. the Epidemic Cholera.

As occurring in India, this disease was characterised by copious vomiting and purging of a watery fluid, (often loaded with flakes of whitish matter) without bile;—by cramps, not merely of the legs, but often pretty general over the body,—and by rapid sinking of the heart's action,—uncommon shrinking or shrivelling, coldness, and often blueness of the surface,—and frequently laborious breathing in the later stages, as in other cases of death by syncope [*]. The blood was always observed to lose its power of coagulation, and to be thick and dark-coloured, very soon after the attack of the disease. All the secretions, excepting those by the mucous membranes and the skin, appeared to be nearly suppressed during the violence of the disease, but the whole duration, whether in fatal or favourable cases, was seldom more than two or three days. In this climate, there is this essential difference from the usual form in

[*] See p. 47.

India, that after the symptoms above mentioned have aba-
ted, and the pulse become pretty full and firm, a state of
fever, more or less distinctly marked, often with delirium,
and always with strong tendency to Coma, very frequently
supervenes, and may be fatal strictly in the way of coma, at
the end of some days, or even a fortnight or more from the
attack. During this febrile or comatose state, although the
seerction of bile (of morbid quality) is generally restored,
that of urine is still frequently suppressed; or if passed it
is generally in small quantity, and of light specific gravity,
and often albuminous.

Both in the warmer and colder climates, it has been dis-
tinctly perecived, that the spasms of the limbs are not merely
the effects of the frequent stools,—not only because they are
more general than those of the common cholera, but because
they have often been violent before there was any diarrhœa,
and continued after that was stopt, even after apparent
death ;—again, that the depression of the heart's action is
not merely the effect of the evacuations, because it is rapid
and excessive in some cases where these are slight;—and
lastly, that the coldness of the surface is not merely the effect
of the depression of the heart's action, because the body has
often become warm immediately before, or even after death.

The most important additional facts which have been
lately ascertained in regard to the changes in the epidemic
Cholera are, that the blood, deprived of much of its watery
constituents by the diarrhœa, is found to contain much less
water, and less of its usual saline ingredients than in health*;
that the watery dejections consist merely of the serosity of
the blood, with a small quantity of albumen ; and that in
the cases of long-continued suppression of urine, the urea
has been detected, as in cases of diseased kidneys, in the
blood, and also in the serum of the shut cavities of the body.

No morbid structure has been ascertained to be constant-
ly present in the bodies of persons who have died of this
disease. A great variety of morbid appearances, found in
such bodies, have evidently existed before the attack of
cholera ; others, such as softness of the mucous membrane

* See O'SHAUGHNESSY, Report on the Cholera, &c.

of the primæ viæ, and unusual development of the mucous glands there, may reasonably be ascribed to the obviously great change in the distribution of the blood. Slight bloody effusions, or ecchymosis, often found on the heart, but more especially on the sympathetic nerves and par vagum, although not essential to the disease, and probably to be regarded as its effects, appear to be important as affording an explanation of a part of the symptoms.

The mode of diffusion of this disease is as anomalous as its symptoms. Although a few cases of violent diarrhœa or cholera (especially such as might be traced to the action of poisonous articles of diet), have shewn symptoms nearly approaching to those of this epidemic disease, yet it is certain that no such disease was frequently seen,—still less did any such prevail epidemically,—in any part of the world before 1817,—or in Europe before 1829, or in Britain before 1831 ;—and that at this day no such disease has been seen in many towns, villages, or districts of this country, while in others it has been very destructive. It is quite in vain, therefore, to attempt to refer the appearance and extension of this disease to the agency of any of those causes of disease, which are of general and nearly uniform operation in any climate; notwithstanding that such causes may very often have appeared, as in the case of other epidemic diseases, to co-operate in exciting the disease in individuals. As this disease has hitherto existed only within certain assignable limits of space and time, so its main cause must be one of local and temporary agency.

It is equally certain, that this disease does not present the usual indications of one which arises from a Malaria; for instead of being confined to certain districts, and those of similar character in different parts of the world,—and of appearing and disappearing at certain seasons or in certain circumstances only,—it has been found to prevail epidemically in all climates and all seasons, and although perhaps most frequently in low moist situations, yet repeatedly in all descriptions of localities.

It may be stated farther, with confidence, that on diffe-

rent occasions, and particularly on several occasions in Scotland, where the introduction of the disease into a town or district previously unaffected, from a known source (*i. e.* by a person coming from a place where the disease prevailed, and falling ill of it in another, previously untouched by it), has been carefully watched,—it has been observed, that those who had intercourse with the sick took the disease, in the first instance, in a proportion so very much greater than those who avoided such intercourse, as to leave no reasonable ground for doubt, that it possesses a certain degree of Contagious property [*].

It is no objection to the supposition of the contagious nature of the disease, that a large proportion of those who have free intercourse with the sick remain unaffected; for, where the disease is epidemic, such persons are necessarily exposed to the local and temporary cause of the disease, whatever it be; and their exemption, although it proves the agency of that local cause to be very irregular (and perhaps contingent on conditions not yet understood), gives no information as to the nature or origin of that cause.

But while a certain degree of contagious property is confidently attributed to the disease, it must at the same time be stated, that when it has become epidemic in towns or districts, many persons have been observed to be attacked, who had certainly no intercourse with the sick; many others, whose intercourse either with the sick or with any thing that could have been in contact with them, must have been very slight and transient; and sometimes it has not appeared, that those who had full and free intercourse with the sick, were affected in larger proportion than either of the two first-mentioned classes of persons.

From these facts it appears to be a perfectly fair inference, that either the disease, besides the degree of contagious property already ascertained to belong to it, has another mode of extending itself, independent of contagion, and not yet understood; or else, that the contagious poison arising from those affected with it, acts according to laws

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materially different from those, which regulate the diffusion of other contagious diseases. It must have the power of extending itself to a very considerable distance through the atmosphere, so as to affect those who are peculiarly liable to its influence; and again its action, even on those the most fully exposed to it, must be very much dependent on other circumstances in their situation. Its effect must bear no proportion to the quantity of it introduced into the system; and its virulence must be liable to great and unaccountable variations at different times.

Perhaps, when the whole history of the disease,—its recent introduction into the world, and its generally following the great lines of human intercourse,—are taken into account, and the analogy of other contagious diseases considered, it will appear more reasonable to ascribe these singular properties to a specific poison of human origin, than to admit two distinct causes for the extensive diffusion of the disease. But it is impossible at present to decide with confidence on these two opinions, and very difficult to perceive, how observations can be so conducted, as to obtain an *experimentum crucis* on the subject.

Two important facts, in regard to the local and temporary cause of the disease (whatever be its nature), seem well ascertained, viz. 1. That its effect on the persons exposed to it is sometimes very rapid, and sometimes delayed for several weeks; and 2. That the effect of its application is very dependent, not only on previous predisposition, but on subsequent contingencies; avoiding which may probably, in many cases, suffice to avert the disease.

The concurrent and accessory causes which seem most efficient in determining attacks of the disease are, previous organic diseases unconnected with febrile excitement, intemperance, and previous diarrhœa.

As the whole history of the disease shews its dependence on a local and temporary cause, so its essential symptoms, and the mode of its fatal termination, evidently assimilate it to the effect of Poisons on the animal economy, much

more than to the phenomena of any diseases which arise from causes of more uniform occurrence.

In particular, the spasms of voluntary muscles, and the very rapid depression of the heart's action,—certainly not referable merely to the amount of evacuation from the primæ viæ,—bear a close resemblance to the action of certain poisons, and to other malignant epidemic diseases proceeding from malaria or from contagion, e. g. yellow fever and plague. And the analogy to other effects of specific or morbific poisons appears farther from the remarkable tendency to reaction of the heart, and spontaneous favourable termination, observed in many cases of the disease, and under all possible variety of treatment.

The remarkable effect of injection of large quantities of saline solutions into the veins, in causing temporary excitement of the heart in the stage of collapse or extreme depression in this disease, shews that a part of the cause of the depressed state of the circulation lies in the altered condition of the blood consequent on the evacuations; but the tendency to syncope is seen too early, and recurs too frequently and too rapidly, after the full amount of water and salts have been restored, to be solely referable to this cause.

The stupor in the later stage of the disease may certainly be ascribed in a great measure to the suppression of the excretions, particularly of the urine; but it is still doubtful whether this may not be in part also a direct effect of the morbific poison.

CHAPTER X.

OF DISEASED STATES OF NUTRITION.

WE here treat shortly of what are generally called Organic Diseases, i. e. both of Preternatural or Morbid Growths in the system, and also of Morbid Changes in the form, size, or texture of organs, which sometimes take place without the formation of any new growth.

These organic diseases become obvious to the senses only when somewhat advanced, and in some parts of the body are necessarily concealed while life lasts; but, in most instances, their existence is pretty clearly indicated in an earlier stage, partly by observation of the diseased conditions and diseased actions from which they may be expected to result, and partly by observation of the altered functions of the parts in which they form, or with which they are connected.

We first enumerate shortly the different morbid changes of structure, or Organic Lesions, to which the different parts of the body are liable, and state what is known of their causes, and afterwards we take a general view of the symptoms that result from them, and the consequences to be expected from them, as occurring in different parts of the system.

SECTION I.

OF MORBID GROWTHS.

ONE kind of morbid growths, or deposits from the blood in the living body, has been already mentioned, and the mode of their formation explained, viz. that which is the result of distinct inflammation, and consequent exudation of coagulable lymph. The new deposits thus formed in the body are somewhat various (if not in their origin, at least after they have existed some time), according to the texture in which they have taken place; e. g. in the substance of the brain or lungs, on bones, on serous, mucous, or fibrous membranes, &c. to the texture of which parts they gradually become more or less assimilated. Some varieties of morbid growths may therefore be traced to simple and healthy inflammation only. But it has been already stated, that when the inflammation causing these has subsided, such deposits, in the perfectly healthy state of the body, are gradually diminished by absorption, and the symptoms result-

ing from them (although sometimes never disappearing, and often easily renewed), gradually abate.

Many, if not all, the new productions of which we are now to treat, may be traced, in many individual cases, to an inflammatory action, and even to a distinct exudation of lymph, in their commencement, and are often evidently aggravated by fresh attacks of inflammation during their progress; but in other cases no such origin can be detected; and, even when they do originate in inflammation, it is plain that they are often different, in their own texture, from the parts in which they form; and farther, that they are not only much less liable to absorption than the simply inflammatory exudations, but go on increasing after all surrounding inflammation has ceased, and often continue to draw supplies from the blood, notwithstanding any evacuations that may be practised. Whether they originate in inflammation or not, they imply a continued *perversion of nutrition*. The epithet *parasitical* is fairly applied to them; and it is obvious that other conditions besides inflammatory action are concerned in producing and maintaining them.

The same observations apply to the cases, in which there is reason to believe that tumors, of various kinds, and in different parts of the body, originate in coagula of effused blood *.

In connexion with this essential peculiarity of these truly morbid textures, it is to be remarked, that according to the observations of SCHRÆDER VAN DER KOLK, the vessels ramifying in such growths have almost exclusively the appearance of minute arteries; whereas in the false membranes from inflammation, many of them are veins †.

We consider the coagulable lymph, effused by inflammation, as the simplest kind, and often the basis of morbid growths; but from this there are many degenerations; and many different classifications of adventitious textures have therefore been attempted, founded on distinctions which are of real importance, but none of which are found to be uniformly observed.

* See p. 393.　　　　　† Observat. Anat. Pathol. p. 46.

Thus, there is a distinction between those deposits which are truly new to the system, existing nowhere in the healthy state, and those which are only found in new situations; but many tumors contain matter of both kinds, being, *e. g.* fatty or bony in some parts, and tubercular or scirrhous in others.

There is a distinction between those morbid growths which consist of membranous and vascular coverings, inclosing matter, whether solid or fluid, which is not vascular, and those which are vascular, and organized in their interior, and grow from within outwards *; but a cluster of tubercles, of whatever kind, is first of the former description, and afterwards, when the individuals composing the cluster have coalesced, it may be said to be of the latter.

There is a distinction, often of the greatest importance, between those morbid formations which are, in the language of some pathologists, essentially malignant,—the growth or varied changes of which cannot be prevented from proceeding, and affecting the system at large,—and those which are either inert in themselves, or innocent in regard to the general health; but tumours which assume the former character are often not to be distinguished, during great part of their progress, from those which remain inert for life.

There is a distinction, perhaps the most practically important of any, between those morbid deposits which are merely local, and those which are generally found to take place simultaneously or successively in various parts of the body; but the same kinds which are strictly local in one case, are found very generally extended in others.

This last distinction, however, we shall observe as far as possible.

I. Of morbid growths, which are generally local, the most important may be included under the following heads :

1. The simplest in structure are the Serous Cysts, *i. e.* shut sacs, containing serum, and formed of condensed cellular sub-

* See SCHRÆDER VAN DER KOLK, Observationes, &c. p. 45.

stance resembling the serous membranes; which are formed gradually around a clot of blood, or any foreign substance in the system, and are frequently developed spontaneously in various parts of the body; *e. g.* in the brain (especially when developed in the choroid plexus), in the kidneys, in the liver, in the ovaries. They are frequently attached to the natural serous membranes, but sometimes quite separate from these; sometimes solitary, sometimes set together in clusters; and their size and shape are very various. They must be distinguished from enlargements of natural cavities, such as the calices of the kidneys, or Graafian vesicles in the ovaries. They are often unconnected with disease of the adjacent textures; but in some cases, these textures are found either wasted by absorption, or disorganized by inflammation around them. There is no evidence of their being generally connected, in their commencement, with inflammatory action; and when they are small, their existence is often not denoted by any symptoms whatever.

Now, from this simple type of diseased structure, there are many gradual deviations. When within one of these serous cysts, which is attached to the surrounding textures, we find along with its fluid contents one or more (often a number) of similar cysts nearly or quite unattached, we apply the name of Hydatids. These are often found in the human body, chiefly in the cellular substance, liver, kidneys, and uterus. From the circumstance of these serous cysts being often quite loose, and of various sizes, apparently drawing nourishment from the fluid in which they float, from their shewing a kind of vital contraction when cut, and from the fluid contained in them being often pellucid, while that of the larger cysts surrounding them is turbid o · even purulent, they have been thought to possess an independent vitality. And if this point be still doubtful as to the greater number of hydatids found in the human body, and in which no distinction of organs is perceptible, (Acephalocysts of LAENNEC), it is generally allowed that such independent vitality does belong to other nearly similar bodies, found in the same situations, sometimes in the

human system, more frequently in other animals, but in which a head, and mouths or suckers, may be perceived (Cysticercus and Polycephalocyst, &c *.)

Again, the simple serous cyst approaches to, and sometimes probably is gradually transformed into, the various kinds of Encysted Tumors, which may form probably in any part of the body that has the cellular structure ; and have received various names according to the nature of their contents, *e. g.* Hygroma, when they contain a nearly serous or seropurulent fluid, or encysted dropsy, if they be of very large size; Hæmatoma, when their contents are bloody; Steatoma, when they approach more nearly to the appearance and consistence of fat ; and Atheroma, and Cold or Chronic Abscess, when they contain purulent matter of more or less consistence, without having been preceded by distinct marks of inflammation. Sometimes substances distinct from any found in the healthy body, or substances which in the natural state exist only in individual parts of the system, (*e. g.* Cholesterine) are found in the interior of these encysted tumors. Those tumors, of this kind, which are of a considerable size, are often formed of a congeries of such cysts, and their contents in the same tumor, are often very various, as is seen remarkably in the most common case of enlargement of the ovary, which appears to consist in gradual distention and alteration of the fluid contents of the Graafian vesicles.

Farther, not only the contents, but the coats or envelopes of these cysts, are subject to a great variety of changes, becoming in some cases fibrous or cartilaginous, or having bony matter deposited irregularly through them.

2. In many cases, though not in all, we can clearly distinguish from these encysted tumors, (where the organized secreting substance is external to the chief bulk of the morbid growth) tumors, the organization of which is so far different, that their substance is penetrated throughout by a vascular cellular or fibrous structure, in which they are

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* See ANDRAL, Precis, &c. t. i. p. 512 ; and KERR in Cyclopædia of Practical Medicine, art. Hydatids.

nourished, and by which they are often divided into lobules. These are generally called Sarcomatous tumors; and the simplest example is the common Vascular Sarcoma, which consists merely of condensed cellular substance, and may be found in any cellular texture, but is often seen in the mammæ and testes. But according to the different situations they may occupy, and the different texture of which they may consist, (sometimes probably from their original formation, and sometimes in consequence of gradual transformation) tumors of the same general structure have received different names, Adipose Sarcoma or Ceroma, when of fatty or waxy consistence; Polypus, when projecting from, and often closely resembling the structure of, mucous membrane; Neuroma, when seated on a nerve, or when growing on its sheath, and splitting up and separating its fibrils; Chondroma, or Fibro-cartilaginous tumor, when traversed by numerous bands or striæ of the consistence of cartilage; and Osteo-Sarcoma, when containing much bony deposition. In many instances, the differences in these morbid textures may be ascribed to their partaking more or less of the nature of the sound texture in which they are developed ; but in some, no similarity of the diseased structure to the surrounding healthy parts can be observed. In some cases, as, e. g. in the coats of the stomach or intestines, it may be observed that the formation of such morbid growths is preceded by simple thickening and hardening of the sound cellular texture, a part of which only afterwards assumes the strictly morbid appearance.

We have no means of certainly distinguishing by appearance in their early stage, the hard swellings, seen chiefly in the most vascular and sensible parts of the body,—the mammæ, testes, penis, lips, lymphatic glands, cardia, pylorus, cæcum, and above all in the os uteri,—and to which the name of Scirrhus and Cancer are given, from others above enumerated, and especially from those called Fibro-cartilaginous; but the history of the affections is widely different, the latter remaining often inert for many years ; while the former continue gradually, although slowly, to increase, are

followed after a time by an extension of the diseased appearance to the surrounding textures, are soon attended with much pain, and ultimately with much constitutional disturbance, and pass very generally in the end into partial but irremediable fungoid ulceration.

II. Other kinds of morbid growths frequently occurring in the body, appear distinctly, and from the first, to depend more on constitutional peculiarity; because they are found from their commencement to originate at different points, often in many parts of the same, or even of different organs; and because in many cases their deposition becomes ultimately very general over the body.

1. Perhaps the most frequent and important of this class of adventitious textures, are the Tubercles already considered, as a form of scrofulous disease, and probably often a product of scrofulous inflammation.

But besides the strictly scrofulous tubercles, there is a very numerous class of organic diseases, depending essentially on the deposition in different parts of the body, of numerous small granular bodies, so nearly similar to the scrofulous tubercles, that they often cannot be distinguished from them in their earliest stage, and therefore often called Tubercles, but which are commonly found at a more advanced period of life, and run in general a somewhat different course. They are for the most part also of a more irregular form, and more unequal size, than the most characteristic specimens of the scrofulous tubercles; but some of them are always nearly spherical, and some of the true scrofulous tubercles are of very irregular form; and in their first stage, these granular deposits, as well as the scrofulous tubercles, appear to consist of concrete albumen. These are most commonly found, and most important as occurring, in the Liver, in the Kidneys, and in the coats of the Arteries; but exactly similar deposits are common in other parts, especially in the serous membranes. They not only present in their commencement, the same appearance in these different textures, but very often they are found

in two or more of these in the same person, and apparently about the same stage of progress. In the liver and kidneys it may be distinctly perceived, that the first step to their formation is the increase or hypertrophy of the greyish condensed cellular texture, which is interposed among the different portions of the glandular substance *; in the arteries they are found chiefly in the first instance between the middle or fibrous and inner coat, but they frequently occupy a large portion of both coats. They are found very frequently on the inner membrane of the left side of the heart, and its duplications forming the valves,—but rarely in the veins or in the right side of the heart.

It is important to observe, that when these granular deposits are formed on membranes, while they add to the thickness, they are generally attended with shrinking or corrugation of the superficial extent of these membranes. This is very obvious, when such deposits form on the membranous expansions forming the valves of the heart, and on the omentum. When they form in irregular patches, on the peritoneal coat of the liver, from the same cause they occasion partial compression and absorption of its substance; and thereby give it a rough or granulated appearance, even when it is little diseased internally; and when they form on the peritoneal coat of the intestines, they likewise shorten or corrugate that membrane, and so disturb the functions of muscular fibres beneath it, as to lead to habitual increased action and hypertrophy of these fibres.

In all these situations, these granular or tubercular deposits, often so materially impede the functions of the parts in which they are formed, and thereby so influence others, in modes to be afterwards explained, as to cause death before they have themselves undergone much change. But when their formation is not so extensive as to be rapidly fatal, they become liable to changes which vary remarkably in different parts, and in different cases. In the aorta and other arteries, they soon become blended with irregular atheromatous, fatty, cartilaginous, or bony deposits, de-

* ANDRAL, Precis, &c. t. ii. p. 585.

stroying the flexibility and elasticity of these vessels; and at the same time with partial ulcerations of their inner, and often likewise of their middle coat. In the liver and kidneys they sometimes coalesce in clusters, and pass on pretty rapidly to suppuration, nearly in the same way as tubercles of the lungs; but much more frequently they merely enlarge more slowly for a time, and harden, and by their pressure on the healthy substance of the gland, cause so much absorption of it, that ultimately the whole organ often shrinks (while its natural structure is nearly obliterated) to less than its original bulk. At the same time, in the liver, these tubercles often acquire a deep yellow colour, and in that state have been described by LAENNEC under the name of Cirrhosis. On the serous membranes such originally tubercular deposits frequently become cartilaginous, and then bony.

2. In almost all parts of the body we occasionally meet with irregular, but encysted deposits, of a very peculiar character, larger, softer, generally of a whiter colour, and growing more rapidly than any kind of tubercles, generally affecting several textures in the same person, and, when they form on the mucous membranes, or come to the surface of the body, often pouring out blood; to which, from their resemblance to the substance of the brain, the names of Encephaloid matter and of Medullary Sarcoma have been given; and again, from their usual form, and the hæmorrhages connected with them, that of Fungus Hæmatodes.

Tumors of this kind in internal parts frequently soften in their centres, and pass into unhealthy suppuration, after the manner of clusters of tubercles; and in external parts, or on the mucous membranes, they usually pass on to intractable ulceration.

This morbid texture has been often found in all the organs of the body, which are resolvable into cellular texture, chiefly in those that are fully supplied with blood, as the testes, uterus, mammæ, lungs, liver, and serous and mucous membranes,—often also in the bones, or their membranous envelopes.

It is found at all times of life, but always in connexion with a feeble and irritable state of the constitution. Tumors of this description may be said to pass by insensible degrees, on the one hand, in young subjects, into the true tubercles, as in cases of tuberculated accretions on the peritoneum, described by BARON and others; and in the other, in older subjects, into the cirroma or chondroma, or even the true scirrhus, and in the same morbid mass, these different textures are sometimes evidently mixed.

The morbid texture described by LAENNEC under the name of Colloid, and distinguished by its gelatinous consistence and translucency, may probably be considered as a variety of the encephaloid matter.

3. Another morbid formation of rare occurrence, but when occurring, generally observed in different parts of the system at the same time, is that called Melanosis, which is easily distinguished by its black colour (excepting only in the case of the lungs, where other diseased conditions may assume this colour from foreign matters introduced there) and soft consistence. It has been found, and often grows rapidly, in almost all parts which have the cellular texture, sometimes inclosed in cysts, sometimes loosely deposited on the surface of membranes, or through the substance of organs, but seems always to be destitute of organization, and to be liable to no other change than reduction to a fluid consistence.

The matter of this diseased structure appears to be merely blood which has undergone some chemical change, chiefly in its colouring matter; and some cases of the disease appear to approach nearly to cases of Purpura, where blood is extravasated in various parts, and with less change of any of its qualities. The melanosis is observed chiefly in old, and almost always in debilitated persons.

The following observations appear to be of importance in regard to all the organic diseases which are distinctly of constitutional origin, i. e. the Tubercular, (especially the scrofulous), the Encephaloid, and the Melanotic.

1. The deposition of these peculiar matters appears often

to be much increased, if not actually determined, by attacks of inflammatory disease,—perhaps especially of those inflammations which often succeed febrile and weakening diseases. In such cases the morbid deposits are not confined to the parts in which symptoms of inflammation appear; but by this circumstance the symptoms of the diseases, which are followed by these morbid formations, are necessarily rendered various, because very frequently complex.

2. While the matter of these morbid textures is concentrated into distinct tumors in certain parts of the body, it is very often irregularly diffused or infiltrated through the cellular texture of other parts, especially of parts adjoining that where the chief deposition has taken place. Thus we have the substance of the lungs very often infiltrated with tubercular matter, at the same time that circumscribed tubercles are disseminated through it, and especially clustered together at its upper part; and similar infiltration of encephaloid, or of melanotic matter takes place, into the texture of various parts, especially if adjoining those in which tumors of these descriptions exist.

3. The matter of all these morbid textures, but especially of the encephaloid and the melanosis, (the formation of which is much more rapid than that of any other morbid growths), is often found, not only in adjoining textures, but especially in the nearest lymphatic glands; and also in the veins leading from the parts in which they are chiefly deposited, and sometimes in other veins of the body.

4. It is an important fact also, in the history of all these diseases, that after the removal of a limb, in which any one of them has existed for some time, it is common to observe fatal disease of some internal organ, which on dissection appears to have resulted from deposition of a similar matter.

The morbid matter of the true Scirrhus and Cancer is often found likewise infiltrated through the organs in the immediate neighbourhood of those most diseased, as in the usual affection of the fundus uteri, where there is cancerous ulceration at the os tincæ; and such matter is found

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also, often in the lymphatic glands, and sometimes in the
blood of the veins, leading from these parts; but this is only
in the advanced stage of such diseases, at which time we
know, that similar formations are very apt to take place in
other parts of the body, or in the same if the most diseased
portion be excised;—*i. e.* that the disease which was at first
local has become constitutional, or acquired the character
to which some authors affix the epithet Malignant.

It seems to be partly in consequence of the great tenden-
cy to similar deposition from the arteries in the immediate
neighbourhood of any of this class of diseased growths, that
the pressure of them on the surrounding parts leads very of-
ten to adhesion and agglutination of these to each other, and
to that which is most diseased; as we see in the almost uni-
form close adhesions of the pleuræ in phthisis pulmonalis,
and in the very frequent adhesions of the different viscera
of the pelvis in scirrhus uteri. By the deposition of
morbid matter in the coats of the vessels themselves, they
are often much obstructed, and therefore ultimately receive
a less supply of blood than in the healthy state, even while
the diseased formations are still advancing. In the case of
the melanosis, however, perhaps by reason of the peculiar
change in the composition of the blood, this tendency to
adhesion of the surrounding textures is much less observed.

There is yet another description of morbid growths, the
origin of which may be conjectured to be peculiar, viz. the
soft fungous excrescences (or vegetations) often seen adhe-
ring to the valves of the heart, particularly when these are
otherwise diseased, and chiefly in subjects otherwise un-
healthy. As these excrescences are often precisely of the
same nature as the fibrinous concretions found in the same
cavities, and as there is much reason to suppose, from the
varying appearances of these concretions, and sometimes
from distinct appearances of organization in them, that
they must have been forming gradually for some time be-
fore death,—it appears highly probable that the fungous ex-
crescences are formed from them.

SECTION II.

OF ALTERATIONS OF TEXTURES WITHOUT THE FORMATION OF NEW GROWTHS.

THE following is an enumeration of the most important of these changes.

1. Although we stated that preternatural softening, and preternatural hardening of textures, were often the direct and unequivocal effects of inflammation, acute or chronic, we must also admit that there are examples of both these alterations of the consistence of various textures, without any evidence of preceding inflammation, to be ascribed only to perversion of nutrition. The brain, spinal cord, the lungs, the liver, the spleen, the kidneys, the muscular substance of the heart and of the uterus, are found in some cases more or less partially softer than natural, in cases that have been perfectly chronic, without change of colour, without any inflammatory effusions aroundthem, with derangement of the functions of the parts, but without any symptoms resembling inflammation before death. The mucous membrane of the stomach is often found remarkably softened, when there is much alteration of the secretions formed in it, and probably chiefly by the action of that secretion, but without clear evidence of any inflammatory action preceding these changes. The inner membrane of arteries is sometimes remarkably softened, and disposed to rupture, with very injurious effects on the circulation, but without any clear indication of the cause of the affection *.

The most general and unequivocal example of softening of textures independent of inflammation, is the great deficiency of earthy matter, and softening of the bones in Rickets; which is attended with a vascular state of the bones, but neither presents the symptoms, nor proceeds from the causes, nor is benefited by the remedies, of inflammation. Some cases of the Mollities Ossium of adults are

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* See TURNER, in Edin. Med. Chir. Trans. vol. iii.

probably of the same character; but it would appear that other cases described under that name have really depended on soft tumors growing from the internal membrane, and causing absorption of much of the substance of the bones themselves.

Preternatural hardness, without preceding inflammation, and without morbid deposits, is probably a rarer case; but may occur in the different parts mentioned, perhaps most certainly and unequivocally in the brain.

2. Degeneration of various textures takes place occasionally by more gradual alteration of the elements composing them, without any morbid growth, or alteration of natural forms; as in the rare case of fatty degeneration of the heart, where its muscular fibres gradually assume nearly the appearance of fat; and in the common case of fatty alteration of the liver, where every section of it presents a surface besmeared with an oily matter. There are cases, chiefly in old persons, of conversion of great part of the arterial coats into cartilage and bone, without either inflammatory appearances, or change of the form or size of the tubes. There are many cases of organic alteration of the liver and kidneys, in which these organs become of a paler colour, and firmer and more uniform consistence than natural, but no distinct morbid growths can be observed, and which would seem to be effected merely by gradual change of the mode of nutrition of the natural texture. The voluntary muscles undergo an essential change of texture, as well as great diminution of bulk, under the influence of the poison of lead, in colica pictonum; and there are a few cases in which they are subjected to a complete transformation, into fatty, or nearly cartilaginous substance, independently of the growth of any morbid texture in the intermuscular cellular substance, to cause compression and absorption of their fibres.

3. It is important to understand distinctly the different conditions under which Hypertrophy, or simply increased bulk, of natural textures may be observed.

a. It has been already stated, that increase of the bulk of sound textures sometimes results simply from the gradual

organization of the lymph thrown out on them by inflamma_
tion. This is seen, *e. g.* in the case of bones, and in that
of mucous membranes, and of fibrous membranes or liga-
ments, after some inflammations of these textures. But in
the greater number of cases, where permanent increase of
bulk follows inflammation, it is attended with some change
of texture.

b. The greater number of cases of hypertrophy of an organ
which we meet with, are cases where its function is preter-
naturally excited, and the flow of blood to, and nourish-
ment of, the organ (always very dependent on the state of
the changes going on at the extremities of the capillaries),
are thereby augmented. Thus it is, that all the voluntary
muscles increase both in bulk and strength from frequent
exercise, that the glandular substance of the mammæ swells
during lactation, &c. ; and just on the same principle,
when one of the lungs, or one of the kidneys, is rendered
unfit for its function, the blood makes its way in increased
quantity, in the direction where the change it is destined
to undergo in these organs can be effected, and the oppo-
site lung or kidney gradually acquires a great increase of
bulk, without change of texture.

So also, when there is a demand for increased action of
the Heart, in consequence of the existence of any disease of
the valves on its left side, or of the aorta, impeding the
transmission of blood, it is gradually brought into a state
of hypertrophy, or what has been called active aneurism,
either of its whole substance or of the parietes of the cavity
most exposed to the increased stimulus; and this most rea-
dily in a constitution otherwise healthy.

When, along with this increased action, and increased
bulk of the heart, there is a full quantity of blood in the
body, the cavities of the heart are usually found dilated at
the same time that their parietes are thickened; but when
the quantity of blood in the body is much diminished, the
tonic contraction of the thickened fibres of the heart, which
is no longer distended, occasions a diminution of the size of
its cavities.

Again, when the Bladder is frequently and strongly excited to action, in consequence of stricture of the urethra, or enlarged prostate, or other obstacle to the discharge of the urine, or, without such obstacle, in consequence of an inflamed state of its mucous membrane, its muscular fibres undergo the very same change. In this case, probably by reason of the supply of fluids to the interior of the cavity being so much less than in the case of the heart, the tonic contraction of the enlarging muscular fibres, produces very generally a diminution of the size of the cavity.

The Stomach has been sometimes observed to increase enormously in size, and its muscular fibres to be unusually strong, when there has been some obstruction at the pylorus, without disease of the coats of the stomach, and when probably the reception of ingesta has not been naturally diminished. Again, when there has been chronic inflammation and ulceration of the mucous membrane of the stomach, and consequent excitement of its muscular fibres, it has been found much contracted. And in some cases, the muscular fibres of the intestines have been found in a state of hypertrophy, when there has been chronic impediment to the passage of their contents.

c. There are other cases where hypertrophy of some part of the sound textures is found as the only, or the original disease, and when no cause for that alteration of the nutrition is detected. In a few cases of hypertrophy of the heart, no adequate cause for the affection is perceived in the state of the valves or of the aorta. The brain has been sometimes found in a state of hypertrophy, of which the marks are, unusual dryness of all its surfaces, diminution of the usual interval between the convolutions, and close apposition of the sides of the ventricles, without inflammatory symptoms or appearances, or other indications of disease. The bones (e. g. of the head) are sometimes found generally thickened, or affected with partial exostosis, in cases where chronic disease, consequent on the compression of the contents of the cranium by the enlarged bone, is the only precursor of death. Partial thickening of the cellular

membrane in various parts, and of the mucous membrane
of the intestines, or of their mucous glands, are occasion-
ally found when there have been no inflammatory symp-
toms, nor any symptoms that can be reasonably ascribed to
this change.   In the case of the cellular and adipose mem-
brane, such partial hypertrophy of the sound texture is
sometimes, though by no means uniformly, a prelude to
the formation of morbid growths.   The spleen has been
often found in a state of hypertrophy, without deposition of
any morbid matter into it, and with hardly any change of
its consistence, especially perhaps in cases of suppression
or retention of the menses.   The thyroid gland is often af-
fected with hypertrophy, and sometimes with other changes
in the endemic bronchocele, and sometimes in situations
where the disease does not prevail, and from causes which
are unknown.   In the same countries where bronchocele
is endemic, cretinism is also frequent ; and in that singular
affection, there is distinct hypertrophy of the bones, and it
has been stated likewise, of the nerves of the face, with de-
ficiency of nourishment of the cranium and brain ; and
these affections seem to depend on peculiarities either of the
air or water of the districts.

4. Atrophy of living textures (besides being in a few
cases, as formerly stated, a result of inflammation) is often
observed as a consequence of disuse of an organ,—afford-
ing another illustration of the dependence of nutrition on
causes which act at the extremities of the circulation.   Thus
the optic nerve has been often found wasted, not only in
cases of amaurosis, but in cases of blindness from disease of
the coats or humours of the eye-ball.   Muscles have been
found so much wasted, in consequence of very long inaction,
that the greater part of their substance could hardly be dis-
tinguished from cellular texture*; and whole limbs kept long
at rest, as by disease of the joints, are apt either to waste,
or to be so limited in their growth, as to appear shrunk
and withered in comparison of the corresponding limbs.

Again, atrophy of any living texture is occasioned by
compression, which is known, and may be easily enough

* ANDRAL, Precis, &c. t. i. p. 240.

conceived, to increase the absorption from it, if not absolutely, at least relatively to the amount of deposition. Hence the growth of any of the morbid textures above mentioned, as well as the effusion of any product of inflammation, is very apt to cause atrophy of the surrounding textures, or even of that in which they are themselves developed,—as we see in the case of tubercular deposits in the liver and kidneys already mentioned, in that of tumors growing from the skull or dura mater, or of serum effused within the ventricles compressing the substance of the brain, &c. In some such cases, if the pressure be rapid, inflammation and some of its consequences are produced at the same time.

There are, further, some cases of atrophy of individual organs which cannot be ascribed to any such cause. Whole limbs, during their growth, are sometimes affected in this way. Lameness in old persons from mere interstitial absorption of the neck of the thigh-bone, is another example. And, in some such cases, the absorption is partial and irregular, giving the appearance of ulceration or of caries, where there has been no decided previous inflammation.

5. There are alterations of the structure of organs, effected in the course of certain chronic diseases, apparently, at least in a great measure, by a process more strictly mechanical than any yet mentioned. Of this kind the most remarkable are,

a. The dilatation without hypertrophy, or passive aneurism of the heart, consequent on obstruction to the exit of blood from it, chiefly in a weakly habit of body, when the excitement of the heart, by the unusual amount of its stimulus is feeble,—sometimes apparently produced merely by morbid debility of its fibres, as after some cases of rheumatism affecting them.

b. The dilatation and rupture of the air-cells of the lungs, known by the name of Emphysema of the lungs, consequent in many instances on chronic bronchitis, but especially consequent on it in those spasmodic affections of the air-passages (asthma and bronchitis) where there are violent fits of coughing, implying frequent and forcible expiration, and compression of the texture of the lungs; and

at the same time constriction of the passages by which the air is expelled. The characters of this change of structure are, unusual lightness and pale colour, and somewhat enlarged bulk of the pulmonary substance, the air-vesicles seen beneath the pleura larger and more distinct than usual, and sometimes bullæ containing air projecting from the surface of the lungs, and empty cavities in their interior, formed by the rupture of many air-cells, and the effusion of air into, and distention of, the common cellular substance of the lungs. The mode of formation of this organic lesion appears perfectly well illustrated by the occasional occurrence of spontaneous emphysema, even extending to the subcutaneous cellular texture of the body, in cases of violent cough with constriction at the larynx, and in cases of voluntary forcible suppression of cries, as during labour.

c. The great enlargement of the bronchial tubes, leading sometimes to almost complete absorption and obliteration of the proper pulmonary substance, which attends some cases of chronic bronchitis, with very copious secretion of mucus; although the conditions which determine this, rather than the last-mentioned change, are not understood.

d. The great distention of the ureter and pelvis of the kidney, and consequent absorption and obliteration of its proper glandular substance, consequent in many cases on obstruction of the ureter, whether from a calculous concretion, or disease of the bladder, uterus, or other adjoining parts.

e. The gradual unfolding of the convolutions of the brain in cases of chronic hydrocephalus, where there has been very great and gradually increasing distention of the ventricles by serous fluid;—for although the whole change, and particularly the absorption of the medullary substance that intervenes between the ventricles and bottom of the convolutions cannot be explained in this mechanical way, yet the change on the convolutions themselves appears to be simply mechanical.

f. The formation of the small encysted tumors called Meliceris on the surface of the body, by the obstruction of the ducts of the small sebaceous glands.

g. The formation of the encysted tumor called Ranula beneath the tongue, by obstruction of the ducts of the sublingual or submaxillary gland.

h. The partial expansion of certain of the fibres of bones, and formation of those tumors upon them called Spina Ventosa, in consequence of inflammation, and of the formation of morbid growths in their internal medullary membrane *.

There is yet another question, of the greatest importance, in regard to many of the organic changes of structure which we have enumerated, viz. whether after they have once taken place, the adventitious matter which has been deposited, or the alteration of natural size or form which has been effected, maybe reabsorbed, or restored to the natural state?

It may be confidently asserted, that the latter of these changes is much more easily effected than the former; the hypertrophy of the heart, *e. g.* may be ascertained sometimes to diminish so remarkably, when it proceeds from a cause (such as lymph effused on the pericardium) which is capable of diminution, that we may infer that it would wholly disappear, if the cause exciting it could be wholly removed. And from the changes of the symptoms, we are well assured that the emphysema of the lungs (*e. g.* after hooping-cough) may entirely subside, when the affection of the air-passages, in which it originates, has disappeared.

It is probable that adventitious textures, which have fairly acquired their distinctive characters, are hardly if at all liable to absorption; but we can scarcely ever judge with confidence during life, as to the time when they are so fully formed and characterized; and we have good reason to believe, that in their *incipient* stage, some of them at least are susceptible of absorption; from what we see in some instances of tumors on the surface of the body, and from what we can observe in some cases also of the effects of remedies and regimen on persons, in whom there are very strong grounds for believing that internal organic lesions of these kinds have commenced. It may be stated in ge-

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* See CRAIGIE's General and Pathological Anatomy, p. 568.

neral, that we have the best illustrations of this remark, in the effect of the antiphlogistic regimen, of the habitual use of antiphlogistic remedies in a moderate extent, and of some of the remedies called Alteratives, in some of the cases where there is threatening of those organic diseases, which are in the first instance strictly local; and again, in the effect of various articles of regimen and remedies, of the class called Tonics, in some of the cases where there is reason to apprehend that tubercular deposits, or others of the class which we have described as constitutional, have already commenced.

SECTION III.

OF THE CAUSES OF THESE ORGANIC LESIONS.

REFERRING to what has been formerly said of the remote causes of disease in general, a brief statement will suffice here, of the conditions under which these different organic diseases appear to be formed.

1. It has already been stated, (p. 73, and 90) that both the lymph that has been thrown out by inflammation, and the blood that has been extravasated in hæmorrhage, may in certain constitutions be converted into various kinds of tumors ; and therefore it may easily be understood, that almost all varieties of organic lesions should often have been observed to originate in external injuries, or other exciting causes of inflammation, or in the circumstances in which it has been stated that hæmorrhages are common.

In particular, it may be observed, that besides the scrofulous tubercles already considered, those very common organic diseases of the heart, the liver, and the kidneys, which consist essentially in minute granular deposits taking place, on the lining membrane of the heart and aorta, or in the coats of the latter, or in the substance of these glands, may very often be traced to the action of the causes of inflammation, (both predisponent and occasional) ; and

especially to the repeated or habitual application of these; and may also be distinctly observed in many cases, to commence with febrile attacks, and with more or less of the usual symptoms of inflammation affecting these parts. And that this should be especially observed of organic diseases of this description is easily understood, when it is remembered, that the first organic change in such cases consists in the augmentation of the dense cellular texture of these parts, *i. e.* of a texture quite similar to that, which is the natural product of inflammatory exudation.

We can have no difficulty, therefore, in admitting inflammation, chiefly chronic, as a frequent origin of this particular class of organic diseases. This may also be concluded, as in the case of scrofulous tubercles, from our often finding on dissection the usual indications of inflammation combined with, and even *passing gradually into*, the organic lesions now in question. But it must at the same time be allowed, that many of the inflammatory appearances found after death in connexion with such organic lesions, are posterior to them in date; and it is further to be remarked, *first*, that acute and well marked inflammation very seldom affects a whole organ, or pair of organs, so generally as this form of organic disease does; *secondly*, that the operation of some other cause than inflammation must be admitted in all those cases, in which distinctly adventitious textures are ultimately developed; *thirdly*, that in some of the cases of organic disease commencing by these granular deposits, neither the application of the external causes of inflammation, nor the symptoms of the first stage of inflammation, can at any time be detected; and *lastly*, that in the cases where such adventitious textures are ultimately found, even if they appear to commence with inflammatory symptoms, and are treated early, the usual remedies for inflammation are found less effectual than in other cases; and in the more advanced stages, when the perversion of nutrition is fairly established, they are often totally inefficient, and contra-indicated by the other circumstances of the disease.

Experience shews, that it is on persons who have been weakened (especially if recently and rapidly weakened) by evacuations, by febrile disease, by impure air and an inactive mode of life, by defective nourishment, by mental depression, or above all, by the debilitating effect of strong liquors, especially distilled spirits, taken to excess,—that cold or other exciting causes of inflammation so take effect, as to excite the diseases in question; and when these predisposing causes have acted with full effect, a very slight application of the exciting causes (especially if repeated) is often effectual for this purpose, where a more powerful exciting cause would probably have determined an attack of acute inflammation. It would appear to be a general fact, that when the circumstances of the living body are such, that the living actions, and the healthy nutrition of the various textures contained in it, are slightly or inadequately excited by the natural stimuli, destined to act upon them, there is always a greater facility of the development of such organic disease, as depends on morbid growths or *perverted nutrition*.

We can frequently assign at least a probable cause for the *seat* of the organic lesion which the concurrence of such causes as have now been mentioned may occasion.

For example, the Heart is peculiarly apt to suffer from such disease in persons who have had its action frequently and strongly excited by general muscular exertion, by exertions of voice in particular,—perhaps also, by mental agitation. The Liver has been observed to be peculiarly disposed to suffer in four distinct cases, *first*, in the inhabitants of hot climates, where it is habitually subjected to a peculiar stimulus; *secondly*, in persons in whom there exists any impediment to the free motion of the venous blood within the chest, and consequent congestion of that blood in the liver; *thirdly*, in persons who have recently suffered, or are occasionally suffering from attacks of intermittent fever, with similar venous congestion; and *fourthly*, in persons addicted to the use of distilled spirits, where, by reason of the great venous absorption from the primæ

viæ, the liver may be supposed to be peculiarly exposed to the action of that stimulus. The case in which the Kidneys have perhaps been most frequently observed to suffer, is that where the exciting cause of the disease has been a copious draught of cold liquid taken when the body was heated, and where it may be supposed, that the effect of the impression produced by the cold was determined to the kidneys by the stimulus always given to their secretion by sudden dilution of the blood.

For the varying *kinds* of adventitious texture, which may be found in different individuals, under the influence apparently of the same external causes, we can in general, in the present state of our knowledge, assign no reason whatever. With the exception of the scrofulous tubercles, and of the medullary sarcoma, the different morbid structures that have been mentioned may be said to be affections of advanced rather than of early life. The true scirrhus and cancer are never seen in early life. This kind of organic disease is nearly confined to the most vascular and sensible parts of the body ; and in the case of the uterus and mammæ, is most apt to take place in them about the time when the secretions formerly taking place there are finally suppressed. This and others of the rarer forms of organic diseases have in some instances appeared to be hereditary, but this is not nearly so well ascertained of any of these, as of the scrofulous tubercles.

All that we can state in regard to the rationale of these formations in the animal economy is as follows :

1. As we have seen reason to believe, that the varieties of the vital act of nutrition, in the different parts of the body in the healthy state, cannot be explained by variety in the form or contractile powers of vessels, but must be referred to a variety of those vital powers by which the chemical phenomena of the living body are determined,—so we cannot suppose that the deviations from the healthy state of nutrition now in question can ever be explained in any other way, than by referring them to changes in the *Vital Affinities* of the solids and fluids of the system. We have every reason to be-

lieve, that these changes, as well as the vital affinities in the natural state, are subjected to certain fixed laws. Of this we see probably an illustration in the similarity of the deposits which take place in very different parts of the body, in many of these organic diseases ; and again, in the relation which the deposits resulting from simple inflammation in each texture, bear to the chemical nature of the texture itself. Another illustration of the subjection of such morbid changes to certain fixed laws, is the fact observed by LAENNEC and others, that when the lymph thrown out in pleurisy is deeply stained wth blood, the adventitious membrane that results becomes cartilaginous, or even bony *. But until the chemical part of Physiology be more advanced, it is in vain to look for the determination of laws in the chemical Pathology of diseases.

2. In the mean time, it is important to observe the circumstances above stated, in which the natural vital affinities existing in the healthy system appear most apt to undergo changes.

3. It is easy to understand, that the morbid deposits will take place from the blood most readily in those circumstances in which effusions of the fluid, or exudations of the more solid parts of the blood, may be effected in a body previously quite healthy ; and therefore, that congestions of blood, and inflammatory action, should so frequently precede and evidently determine the appearance of these organic diseases. Chronic inflammation appears to have more effect in this way than acute, probably both because its duration is longer, and because the blood in the diseased parts is subjected to less pressure, and allowed to stagnate longer, than in acute inflammation.

4. In the case of those organic diseases which are strictly local, it is by no means clear, and often it is improbable, that any deviation from the natural state of the blood, throughout the body, exists; although the vital affinities by which the products formed from it at one spot are determined, have undergone a change. But in the case of those

* Traité de l'Auscultation, &c. t. ii. p. 121.

deposits which take place simultaneously, or in quick succession in many different textures and organs, we have good ground for believing that the blood itself has undergone a change, partly perhaps in its chemical, but more particularly in its vital properties.

5. It is probable, from the examples we occasionally see, of extensive deposits of morbid matter taking place very rapidly, in persons in whom there is no indication (from previous symptoms, or post-mortem appearances) that any such disease had formerly existed,—that the diseased state of the blood concerned in such productions may exist, where no morbid deposits from it have yet occurred. But we have also reason to think, that the blood is gradually deteriorated in consequence of the existence of any local disease, in which certain products are deposited from it; and the observation of morbid matter being found in the veins leading from such diseased parts, and the comparison of this with facts formerly stated as to suppuration *, enable us in a great measure to understand how this deterioration of the blood may be accomplished, and how diseases originally local may become constitutional;—a portion of blood which passes through the vessels of the diseased parts probably undergoes the same degeneration as that which is there extravasated, and the morbid matter thus formed, and circulating in the blood, is afterwards determined, either to that or any other part in which diseased action may be established; nearly in the same manner as Urea, circulating in the blood, is determined to the kidneys, or uric acid to parts affected with gout, where it is deposited in concretions.

But even while our information as to the intimate nature of the processes by which these organic lesions are formed, continues as limited as at present, it is obvious, that our knowledge of the causes from which they originate, of the symptoms by which they may be recognised, and of the dangers to which they may lead, may be extended and corrected, and applied to useful purposes;—sometimes to the preven-

* P. 118 and 9.

tion of such diseases, often to the detection of them in their earlier stages; that it may often enable us to remove causes by which they may be aggravated,—and to counteract those ulterior changes which frequently supervene upon them and increase their danger; and that by it we should regulate our practice in regard to them, even when it has become obvious that the only rational object of that practice is the relief of suffering.

SECTION IV.

OF THE SITUATIONS, SYMPTOMS, AND FATAL EFFECTS OF THESE ORGANIC LESIONS.

We here attempt a very general outline of the kinds of these organic lesions generally found, and the effects they generally produce, in the different organs, or sets of organs, employed in the principal functions of the body.

From what has been said of their frequently originating in, or being repeatedly aggravated by, inflammation, and from what has been formerly said of change of functions, and, among others, of secretions, in internal parts, forming great part of the symptoms of inflammation in these, it will readily be understood, that the symptoms of organic diseases in internal parts should in general very closely resemble, and often be hardly distinguishable from, those of the more chronic inflammations of the same parts, or of the altered secretions of these, already considered. Indeed it is often only by the continuance of the complaint, by the experienced inefficacy of ordinary remedies, and by the increasing weakness and emaciation attending it, that the existence of Organic Disease is made known.

It may be stated in general, that Pain is little to be depended on as a mark of organic disease. It may be felt strongly when there is no such disease, and be intense when such disease is slight, as when the fibres of a nerve are compressed or stretched; it may be absent when the disease is very dangerous; and although the most ma-

lignant organic diseases are often attended with acute pain,
yet it is usually liable to great and long remissions. It is
very often to be regarded, therefore, rather as an acciden-
tal concomitant, than as an essential constituent of such dis-
eases. And in general, these diseases are to be recognised
much more by alterations of sensible qualities, or derange-
ment of functions, which may be detected by the senses of
the practitioner, than by such uneasy sensations as are
known only through the complaints of the patient.

I. In the Organs of Circulation, by far the most com-
mon kind of organic disease is that which affects chiefly
the inner membrane of the heart and larger arteries. In
both situations this membrane is very liable to become
thickened and corrugated by deposits of lymph in irregular
patches, or in the tubercular or granular form mentioned
before, which, in the arteries, soon extend to, or even ori-
ginate in, the middle coat also. That these deposits are
frequently the result of inflammation (sometimes pretty
acute, more frequently chronic) appears chiefly from three
facts, *first*, That the symptoms of disease of the heart,
which are ultimately ascertained to depend upon them, of-
ten commence suddenly, from the causes, and with the in-
dications of inflammatory disease; *secondly*, That they are
often intimately combined with such appearances on the
inner membrane,—(thickening and softening, and exudation
of layers of soft lymph, or small purulent deposits behind
it),—as unequivocally denote inflammation; and *thirdly*,
That these changes on the inner membrane of the heart,
and aorta, as well as the effusion of lymph in the pericar-
dium, appear, from the history of cases where they are
found, frequently to result from the metastasis of Rheu-
matism.

But in some cases, where these appearances in the lining
membrane of the heart and aorta are found, the disease is
known to have commenced gradually, and without febrile
or inflammatory symptoms; and in all cases the changes in
this texture are very apt to continue and extend beyond

the usual effects of inflammation; the inner surface of the
vessel becomes irregularly studded over with patches of
dense opaque matter, of the kinds described as atheroma,
steatoma, cartilage and bone; the last of which is deposited
irregularly, and in the arteries very often simultaneously
with irregular ulceration.   These changes extend to the fi-
brous coat of the arteries, their whole texture becomes thick-
ened, rigid, and inelastic, and their calibre is in general ir-
regularly enlarged.

From these changes in the different branches of arteries,
various formidable diseases manifestly originate.

1. When the ulceration effected at any one part of an ar-
tery is such as to cause the entrance of blood into the cavity
thus formed, and its stagnation there, the exterior mem-
brane, which resists the ulceration, is gradually distended,
and the Aneurism of SCARPA, or pulsating tumour on an ar-
tery, formed by blood which has penetrated the two inner
coats, and distended the outer, is established.   In other
instances, it must be admitted, that aneurismal sacs or
pouches are formed on arteries, of the mode of formation
of which we have no such accurate knowledge.   These an-
eurisms are found in very various parts of the body, chiefly,
as may be readily supposed, at flexures of the arteries; and
as they enlarge, they compress and cause absorption of all
surrounding textures; their pulsations are in most parts
perceptible to the touch, and sometimes, when within the
thorax, and not to be reached by the finger, may be detect-
ed and distinguished from those of the heart by the stetho-
scope.   Their other symptoms are very various, depending
sometimes on the degree of obstruction to the circulation
which they present,—sometimes on the disturbance of the
functions of the parts in their neighbourhood,—often chief-
ly on the nerves which they stretch or compress, and in
the sentient extremities of which they excite sympathe-
tic pains.   These effects of aneurisms are sometimes fatal
without any rupture of the sac; but they are more fre-
quently fatal by rupture and discharge of blood, either ex-
ternally, or into some cavity of the body,—the interior of

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the cranium, the larynx or trachea, the stomach or bowels, the cavity of the thorax, or abdomen, or pericardium.

2. From the rigid, inelastic, and brittle state of the smaller arteries of the brain, arises very often their easy rupture on occasion of sudden determination to the head, and either fatal apoplexy or palsy ; or, even independently of rupture, such a deranged, probably retarded, state of the circulation in the brain, as may cause various diseases there.

3. From the same state of the arteries of the extremities, disqualifying them for their office in the propulsion of the blood, arises, in many cases, the tendency to gangrene there from slight inflammation.

It is to be observed here, that the peculiar thickened and softened condition already mentioned, as occasionally observed in the inner coat of arteries, leads sometimes to sudden rupture of the diseased coat, which then becomes coiled up, and obstructs the artery, stopping pulsation, and leading often rapidly to gangrene of the limb below.

4. The morbid changes in the lining membrane of the heart and arteries, are the most frequent cause of dilatation or hypertrophy, or the combination of the two, in more or fewer of the cavities of the heart. The rigid inelastic state of the aorta, when pretty general, is sufficient to effect somewhat of this change on the heart, even when all the valves are sound ; but in by far the greater number of cases, when diseased aorta attends enlarged heart, it is the participation of the aortic valves in the diseased state of the inner coat of the artery, which chiefly determines the affection of the heart.

All the valves of the heart are liable to two forms of disease, from the morbid concretions forming on them, which disturb the functions, and lead to the enlargement of the heart itself,—viz. to that in which the orifice is narrowed and obstructed by the morbid matter, and that in which the valves are so shortened as to allow of reflux of the blood ; these two states often exist separately, but in many cases also, the same valve is affected in both ways at once.

It may be observed, that the diseased state of the aorta,

extending to its valves as above described, is hardly ever seen in children, and chiefly in advanced life;—but a morbid state of the valves of the heart only, and especially of the mitral and tricuspid, is not uncommon about or even before the age of puberty.

The general symptoms resulting from such impediments to the free flow of blood through the heart (which exist in a great majority of cases in the left side of it), are Dyspnœa and Palpitation, always produced by exertion, often excited also by mental emotion, and occasionally recurring without obvious cause; disturbed sleep, and particularly sudden starting from sleep, with palpitation; the countenance generally becomes pale; and, in some persons, fits of syncope, and in others fits of angina pectoris supervene. But the most unequivocal sign is such enlargement of the heart, as causes the apex to be felt to strike against the parietes of the chest, lower than the sixth rib, which is very often perceptible within a few weeks after the first indications of these organic diseases commence.

These are the general symptoms, which indicate that there is some difficulty in the transmission of blood through the heart, and consequent enlargement of the heart. This is most frequently dependent on some change of the kinds above described in its valves; but may also depend on lymph thrown out by inflammation on the pericardium, shackling and impeding the movements of the heart; or on an unusual narrowness of some of the openings, or shortness, without morbid structure, of some of the valves; or on a preternatural dilatation, without change of texture, in the ascending aorta; or, in a few cases, may exist without obvious cause.

While these general characters of organic disease at the heart exist, there are many varieties in particular symptoms, of less urgent importance, but which claim attention. The chief of these are the following:

1. In many cases, the pulse at the wrist is preternaturally strong, full and regular, or nearly so; and the pulsations of the carotid, and especially of the subclavian arteries, are felt

distinctly to be fuller and stronger than natural. In such cases, the aorta is very generally enlarged; and if there be, as is most common, disease of the valves, it is of the aortic valves, and of such a kind as to admit of reflux of the blood.

2. In others, the pulse at the wrist is small in comparison with that felt at the breast, often very irregular. There is no strong action in the carotid or subclavian arteries; and sometimes there are pulsations felt at the chest, which do not extend to the wrist. In such cases, the aorta is probably little affected; if there be disease of its valves, it is such disease as obstructs the exit of the blood from the ventricle : disease of the mitral valve may rather be presumed ; and, if the last mentioned symptom be present, such a state of that valve is commonly found, as admits of a reflux of blood into the auricle.

3. In some cases, the *impulse* felt on laying the hand or the ear over the heart is very strong, while the sound of the heart's action is less than natural. In such, Hypertrophy of the muscular parietes of the ventricles (chiefly the left), is denoted, without dilatation, perhaps with diminution of the cavity.

4. In others, the impulse is weak, while the sound, and especially the first sound, corresponding to the ventricular contraction, is unusually loud and sharp. This usually denotes Dilatation without hypertrophy. When there is both the loud sound and the strong impulse, both dilatation and hypertrophy are denoted.

5 In some cases, the chief impulse and sound are perceived near the end of the sternum, and the jugular veins appear more turgid, and often pulsate more distinctly than usual. In such, obstruction on the right side of the heart is denoted.

6. In some cases, a preternatural sound, varying considerably in different cases, but generally approaching to the murmur of bellows (bruit de soufflet), is heard to accompany either the first and long, or the second, short sound of the heart's action ; and this generally denotes that some rough or irregular obstacle exists, either at the orifice through which the blood, in its natural course, is passing

at the time, when that sound is produced, or in that through
which it has an opportunity, in consequence of the disease,
of regurgitating *.   But no absolute reliance can be placed
on this symptom, because it may undoubtedly be correctly
imitated by the motion given to the blood by irregular
contractions of the fibres of the heart, chiefly in cases of
palpitation from affections of the nervous system, where no
organic disease exists †.

7. In some cases, the sound on percussion in the situa-
tion of the heart, is remarkably dull; which, if taken along
with other indications of organic disease, denotes either an
effusion into the pericardium, or an unusual degree of en-
largement and hypertrophy of the heart.

When such unequivocal indications of organic disease at
the heart exist, the progress of different cases is still very
various.   The case of hypertrophy, without obvious cause,
and that of enlargement or hypertrophy from the effects of
inflammation of the pericardium, are probably the only cases
in which material amendment of the state of the heart may be
anticipated, and that chiefly from gradual and spontaneous
changes.   In some, all the symptoms may remain stationary
for a length of time, but in others there is a rapid increase
of those depending on the affection of the heart itself; and
in all cases, sooner or later, it is to be expected that other
complaints, consequent on the disordered state of the circu-
lation, will supervene, and their indications combine them-
selves with the symptoms already mentioned.   These con-
sequences take place more rapidly and more surely in young
and full-blooded subjects, than in persons already old and
emaciated.   It is to be observed that the affection of the heart
seldom acts as their sole cause.   It is a great and permanent
predisposition to them; but, in the majority of cases, some
of the exciting causes of disease, and especially of inflamma-
tory disease, most generally cold, intemperance, or muscu-
lar exertion, and some inflammatory disease consequent on
them, may be observed to act in producing these effects.

* See HOPE, Treatise on the Diseases of the Heart, &c. p. 340 and 580
† Ibid, p. 72, 76.

When these exciting causes are carefully avoided, the fatal effect of the affection of the heart may sometimes be averted for a long time; but the longer the organic disease has lasted, and the more it has disturbed the circulation, the less amount of exciting cause is necessary to produce these injurious effects.

The organic affections of the heart predispose to these consecutive diseases, partly, as is supposed, by the increased impetus of the blood in the arteries, which is given by the heart in the state of hypertrophy; but certainly chiefly by the obstruction to the flow of blood in the great veins, and in the lungs, which is produced in the ways above described, and which leads to the dilatation or hypertrophy of the heart.

Of these ulterior effects of such obstruction, the following are the most important.

1. Attacks of Bronchitis are easily excited, and are unusually obstinate in such cases; and hence cough, expectoration, and habitual dyspnœa, with the sonorous, sibilous, and mucous râles, more or less general over the chest, soon supervene in cases of this kind, and often attend them from the first. In certain constitutions also, occasional paroxysms of spasmodic Asthma (to be afterwards considered), take place in this, as in all other complaints attended with any permanent embarrassment of respiration. In many there are repeated attacks of true Peripneumony.

2. Attacks of Hæmoptysis, and, with or without hæmoptysis, of Apoplexy of the lungs *, are also common, particularly in cases where the chief obstruction is at the mitral valve, evidently because the auricle has much less power than the ventricle, to react against any obstruction, and maintain the average velocity of the circulation.

3. Partly in consequence of the increased impetus from the left ventricle, in the case of hypertrophy, and partly of the obstructed return by the veins of the head, in the frequent congestions of the lungs, there are frequently symptoms of Plethora Capitis, in connexion with organic disease

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* See p. 71.

of the heart. In some persons there are repeated attacks of Epistaxis, and in others, or subsequently in the same, there are strokes of Apoplexy or Palsy, or fits of Epilepsy, even when there is no extension of disease of the arteries to the interior of the cranium, to facilitate their rupture.

4. The obstructed state of the circulation, in cases of diseased heart, and the frequent congestion of blood in the lungs, lead very generally to stagnation of blood in the Liver,—sometimes to occasional turgescence of the liver during paroxysms of dyspnœa, and much more frequently to enlargement, morbid induration, and deposition of one kind or another, both in the liver and spleen.

5. The same obstructed state of the circulation, especially if aided by the exciting causes above mentioned, leads generally, sooner or later, to the effusion of serum in some part of the capillary circulation, independently of inflammation there, *i. e.* to Dropsical Effusion ;—in the cells of the Lungs, in the sac of the Pleura or Pericardium, in the subcutaneous Cellular Substance, and, especially after the liver has become affected, in the cavity of the Abdomen,—the symptoms and effects of which effusions will be shortly considered afterwards.

From what has been stated, it will readily be understood in what manner these organic diseases of the heart, besides involving the risk of sudden death by Syncope, naturally lead to such changes as threaten death, frequently by Asphyxia, and occasionally by Coma ; and farther, by the general depressing influence of frequent uneasy sensations, and often by the more special influence of disease of the liver, so impair the actions of digestion and assimilation, as to weaken the whole system, and dispose it to suffer from the application, and to sink under the effects, even of slight exciting causes of disease.   There are a few more obscure cases of Palpitation, and of fatal Syncope, depen denton disease of the muscular parietes of the heart only,—on their softened state,—on their fatty degeneration,—or on their rupture, which has been observed almost solely in the left ventricle, and after ulceration of the inner membrane.

II. In the organs of Respiration there are, in the first place, important organic changes of structure, consequent on simple inflammation.

From inflammation (generally chronic) of the Pleura, may arise not only effusion of pus into the side of the chest, rendering it dull on percussion, impeding its movements, and suppressing the natural murmur in it; but distention of the side, displacement of the heart, (causing its apex to strike to the right of the sternum, if the left side of the chest be diseased, and below the sixth rib, if the right be diseased); and total uselessness of that lung; often of long standing, before either death takes place, in consequence of hectic fever and dyspnœa,—or ulceration and escape of the pus, internally or externally, relieves the patient. In such cases the lung, even if not previously itself inflamed, becomes so condensed in texture by the super-incumbent pressure, that if an opening or natural ulceration take place into the cavity of the chest, the evacuation or escape of the fluid is only partial; because the lung, unable to expand itself, cannot admit the air, nor fill that cavity. And if the case is to terminate favourably, the secretion of pus abating, and the lung remaining condensed, the natural consequence is, that the parietes of that side of the chest are contracted *, and from being larger, it becomes smaller than the sound side; and either continues so for life, or is gradually and imperfectly restored to its form, as the lung is gradually expanded,—a change which sometimes, but not very frequently, ensues.

Even when there is no fluid effusion left by pleurisy, the thickness and strength of the adhesions left between the pleuræ is sometimes such as to impede the free motion of the lung of that side, and make the sound on percussion permanently duller, the respiratory murmur fainter, and the side of the chest less moveable, and even somewhat smaller, than the other; and this especially if the pleurisy has been attended with effusion of blood, and the adhesive matter thrown out becomes cartilaginous †.

* See Physiology, p. 145.   † See p. 253.

2. From partial inflammation of the substance of the Lungs results condensation of these portions, which, although it may in some persons be gradually removed by absorption, or by expectoration, certainly in others remains permanently, causing shortness of breath, absence of the natural respiratory murmur in the affected parts, and sometimes the resonance of the voice, called Bronchophony,—and if the diseased part be considerable, imperfect movement of the side of the chest, and more or less dulness on percussion of the part. In some instances this goes on to pulpy softening, and in a few to suppuration and ulceration, of the affected portion of lung.

3. Still more frequently, in consequence of long-continued and repeated Bronchitis, especially if it be attended with asthmatic paroxysms, the lungs pass more or less generally into the state of Emphysema, above described *, which implies permanent shortness of breath, and is recognized chiefly by remarkable resonance of the chest on percussion, coinciding with absence of the natural respiratory murmur, and generally the presence of catarrhal râles, at the part affected; often indeed over the whole chest.

In all these cases of habitual Dyspnœa consequent on the effects of simple inflammation within the chest, the true Hectic Fever is sometimes formed, especially in young and irritable subjects, and the general symptoms may be just those of phthisis from ulcerated lungs; and in the two last cases the expectoration is often purulent for a length of time. And in many cases, chiefly in older persons, lesions of these kinds within the chest become attended with the same consequences, in other parts of the body, as were described from the obstructions at the heart; especially the depositions in, and induration of, the liver, and the dropsical effusions.

The other frequent and fatal organic disease of the lungs is Phthisis, consequent on the deposition there of scrofulous Tubercles, and on the changes in these, which were formerly

described; and in regard to this the following are the leading facts to be kept in mind.

1. When the deposition is very general over both lungs, the disease may be fatal before any of the tubercles have suppurated, and even before many have coalesced. Such rapid and extensive depositions proceed from the usual causes of inflammation, acting on a scrofulous habit. In such cases, the general symptoms are those of pneumonia, of somewhat slower progress and longer duration than usual, the patient may not be emaciated at the time of death, and the respiratory murmur may be heard throughout the lungs, though mixed with the bronchial râles; insomuch that the stethoscope may fail to give any indications of phthisis *.

2. In other cases, likewise of more rapid progress than usual, the cellular substance of one or both lungs may be extensively infiltrated with the *diffuse* form of tubercular matter, especially if some distinct tubercles have already existed in them; and this may cause death by asphyxia, without suppuration, or with very partial suppuration of the tubercular matter. Here, likewise, the general symptoms are very nearly those of pneumonia, and the affected part is indicated as in pneumonia, sometimes by pain of side, more generally by the sound on percussion becoming somewhat dull, and by change of the respiratory murmur there, which becomes faint, or somewhat harsh and abrupt (bronchial), and sometimes disappears.

3. In by far the greater number of cases, tubercles are deposited first in the upper lobe of one or both lungs, enlarge, coalesce, suppurate and ulcerate, and form cavities the contents of which escape by expectoration, and in which, and in the bronchiæ leading to which, puriform matter is copiously secreted; and they are followed by successive depositions in the central and lower part of the lungs, which run the same course; but so slowly that the tubercles in the lowest part of the lungs are seldom advanced beyond their first stage at the time of death.

* Laennec, Traité de l'Auscultation, &c. t 1. p. 530.

In such cases the nature of the disease is often indicated, almost with certainty, before the patient is much emaciated, by the sound on percussion in the upper part of one or both sides of the chest becoming dull,—by the respiratory murmur there being altered and diminished, and often by resonance of the voice heard through the condensed lung at that part (bronchophony); and afterwards the excavation of the tubercular masses is denoted at one or more points of the upper part of the chest, by the resonance of the voice combined with the gurgling sound of air passing through a cavity, and raising bullæ in a fluid there, (gargouillement), and by such modifications of the voice, and of the other sounds heard at that part (cavernous râle, cavernous respiration and cough), as, when compared with the natural sounds, convey the impression of a hollow cavity there existing. True Pectoriloquism is then established.

Such changes occur chiefly, though not exclusively, in persons who may be judged, by the circumstances formerly mentioned, to be of scrofulous habit, and often in persons who have indications of other scrofulous diseases. They are attended by long continued cough, and excepting in a very few cases (where the excavation appears to be effected by ulcerative absorption only), by expectoration in the advanced stage of the disease, partly puriform, often at times bloody, and sometimes containing fragments of tubercular matter; they are attended by progressive emaciation and debility; and, in young and irritable constitutions especially, by hectic fever. In all cases they cause the breathing to be somewhat confined, and to be easily hurried by exertion; but as the whole quantity of blood is gradually diminished during their progress, and the blood gradually diverted from the most diseased parts of the lungs, they may go to a great extent, and ultimately disorganize two-thirds, or even three-fourths, of the lungs, without ever causing much suffering by dyspnœa.

4. The rapidity of progress of these changes is exceedingly various in different cases, and there are two ways in which tubercular deposits in the lungs, when to a small extent only, have been observed to pass into an inert condi-

tion, and cease to disturb the general health; viz. 1. By hardening into earthy concretions; and 2. By suppurating completely, and discharging themselves by the bronchiæ, and leaving only fistulous cavities in the parts they have occupied. The very generally fatal result of the disease is to be ascribed therefore simply to the circumstance of the very great tendency to successive depositions of the tubercles.

5. In the course of this disease, several circumstances frequently occur, which render the symptoms more complex, and often hasten the fatal event, especially the following.

a. Attacks of Hæmoptysis consequent on the erosion of bloodvessels by the ulceration.

b. Attacks of Pleurisy or of Empyema with pneumothorax *, consequent on the extension of the ulceration to the surface of the lung at a part not occupied, as the pleura at the most diseased parts usually is, by effused lymph forming firm adhesions.

c. Attacks of occasional or *intercurrent* Inflammations of the substance of the lungs, to which the tubercles may be considered as always affording a predisposition, but which are often excited by external causes, and the indications of which are very often found ultimately combined with those of the tubercular disease.

d. Attacks of Dropsy, more or less general;—which, however, seldom results from the tubercular disease of the lungs, unless already combined with inflammatory condensation.

When none of these complications take place, the fatal event often takes place rather by syncope than by asphyxia, —sometimes pretty suddenly, oftener in a way nearly as gradual as the death by mere inanition.

6. The debility in the later stages is increased not only by the hectic sweats, but by the affections of the abdominal viscera, which very generally take place, and which may be traced, partly to the obstructed state of the lungs and consequent congestion in the vena cava ascendens and vena portæ, and partly to the influence of the *tubercular diathesis*; viz. the enlargement and induration, sometimes the tuber-

cular state, and sometimes the fatty degeneration of the Liver (with which various dyspeptic symptoms are often connected); and the inflammation, and ulceration, with tubercular deposition in many cases, in the Mucous Membrane of the Bowels, and frequently also, the tubercular state of the Mesenteric Glands;—which are found when the colliquative diarrhœa has been urgent, but bear no fixed proportion to the other symptoms.

Besides the scrofulous tubercles, other adventitious textures,—the medullary sarcoma, the melanosis, and sometimes more isolated morbid growths, occasionally form in the lungs, and obstruct the breathing ; and produce symptoms, and follow a course more or less similar to the common tubercles there.

Other parts within the chest are likewise frequently the seat of tubercular, encephaloid, or other morbid deposits. The bronchial glands are very generally affected, in like manner as the lungs, in phthisis, and occasionally even when the lungs are sound ; and when these glands are much enlarged and altered by these diseases, hectic fever may be established in consequence of the diseased action going on in their substance ; and the functions of the neighbouring parts, as of the lungs, the trachea, and bronchiæ or the œsophagus, may be variously affected,—or dropsy induced by their pressure on the great veins.

The Air-passages, especially their mucous membrane and the cellular texture immediately behind it, are also the occasional seat, either of morbid deposits, of different kinds that have been enumerated (most frequently of tubercles or medullary sarcoma), or else of ulceration, extending to the cartilages, without distinct previous deposition. This is most common in the cartilages of the larynx, and about the rima glottidis. From these result symptoms resembling those of chronic laryngitis, and sometimes death by asphyxia, or nearly by strangulation.

III. The most common organic disease of the Liver is the tubercular degeneration, sometimes appearing as the result

of pretty distinct inflammation, sometimes gradually effected without inflammatory symptoms; beginning as simple increase, or hypertrophy, of the grey cellular texture, and passing ultimately into the state described as Cirrhosis, in which the whole organ is often shrunk, the glandular substance nearly absorbed away, its place occupied by irregular clusters of brownish-yellow tubercles, and the whole circulation in the liver, as injections demonstrate, very much lessened. But in different cases (by reason especially of the complex nature of most such), death takes place in very different stages of this progress; and many modifications of these changes are also observed. In serofulous cases, the liver is sometimes infiltrated with tubercular matter, in its first stage, of nearly opaline lustre ;— in some instances it is enlarged and much hardened, with little change of colour;—in others it undergoes the fatty degeneration, formerly mentioned, or is simply softened without other change of texture;—in some the tubercles become large and distinct in parts of the liver, while others are of natural structure ; and there are three kinds of morbid growth, which may be easily distinguished from the more usual changes in the liver,—the effusion of clots of blood, which gradually change into various kinds of tumor *,—the medullary sarcoma (tuber circumscriptum of FARRE), which softens in the centre, and is generally attended by similar deposits in other parts,—and the cysts or sacs containing Hydatids.

The Bile in these different diseased states of the liver is often scanty, and either lighter or darker coloured than natural ; but the alterations which it undergoes have not been carefully examined. In most of those cases, where a considerable portion of the substance of the liver remains sound, the bile is of natural appearance and quantity; and in some of those where its whole structure is diseased, the alterations of the secretion are less than might have been expected.

From what has been already said (p. 58 and 251.), it

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* See p. 73.

will be understood, that such organic lesions of the liver are
chiefly to be expected in persons somewhat advanced in
life; and that the tendency to them is remarkably given by
chronic diseases of the heart or lungs, by intermittent fe-
ver, and by the habitual use of distilled spirits, especially
in circumstances otherwise favourable to the formation of
organic disease.

The symptoms attending such organic lesions of the
Liver, especially when they do not distinctly commence
with marks of inflammation, are extremely various.   The
most certain is perceptible enlargement of the organ, with
dull sound on percussion, as far down the abdomen as the
diseased organ stretches; but this enlargement may be ab-
sent throughout a case of the worst kind, and may disap-
pear in the later stages of cases where it was at first dis-
tinct.   When it is absent, the difficulty of lying on the
opposite side is not to be expected.   Sharp pain in the
hypochondrium or shoulder, seems to be an accidental,
and not a very common, attendant of any kind of these
deposits.   Jaundice is only to be expected, if there be
pressure on some of the gall-ducts; which is neither con-
stant, nor, if present, necessarily permanent.   A sallow
though not jaundiced complexion is very often observed,
but is by no means peculiar to organic disease of the liver.
The alterations of the alvine evacuations are various, and,
agreeably to what is stated above, are sometimes absent,
even when great, although partial, alteration of the sub-
stance of the liver exists.   And the dry cough, and confined
breathing on the one hand, or the sympathetic affections com-
monly referred to the stomach, anorexia, sense of oppression,
flatulence and acidity, nausea, vomiting, &c. on the other,
though often obvious and distressing, are neither uniform nor
characteristic.   The existence of organic disease of the liver
is therefore often a matter of probability, rather than of cer-
tain knowledge, and gathered from observation of two or
more of the symptoms above noted, rather than inferred
from any one pathognomonic symptom.   The nature of the
organic affection is of course still more obscure; but it

may be stated, that in a constitution previously healthy, and when such a cause exists for liver disease, as organic obstruction in the chest, and especially if the symptoms have been originally inflammatory, we may generally expect the induration by small granular tubercles only ; and that when the health has been otherwise long infirm, and perhaps especially when the stomach is much affected, the medullary sarcoma, or other constitutional morbid structure, may be suspected.

The greater number of such organic alterations of the liver must necessarily obstruct more or less the flowtof blood in the vena portæ, and hence they act very generally as a great predisponent cause, and sometimes as the only perceptible cause, of farther diseases of the abdomen, which frequently contribute to indicate their existence. These are,

1. The effusion of serum into the cavity of the abdomen, constituting Ascites.

2. The increased flow of the mucous secretion of the intestines (more common in the warm climates), constituting mucous Diarrhœa, but easily aggravated into the form of Dysentery

3. Bloody discharges from the primæ viæ, i. e. Hæmatemesis, Melæna, or Hæmorrhois, or a combination of these.

The debility and emaciation consequent on those organic diseases of the liver, which are attended with the greatest sympathetic affection of the stomach, nausea and vomiting, sometimes go on to a fatal termination, without any of these ulterior consequences ; but more generally either dropsy, and consequent dyspnœa, or mucous or bloody diarrhœa, has existed for some time before death. In all kinds of severe affection of the liver, it sometimes happens that a sudden attack of coma, not always explained by effusion in the cranium, takes place. It is uncertain whether this can be ascribed, as in the case of disease of the kidneys, to retention of matter destined to excretion.

It has been already explained, that the Spleen is affected with organic disease most generally at the same time, and

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in the same manner as the liver. In some instances it is
the seat of morbid deposits, or of simple Hypertrophy
(sometimes going to an enormous extent) when the liver is
sound. Such affections of the spleen have been sometimes
found, as the chief morbid appearance, when there has
been much vomiting, and great and progressive emacia-
tion and debility. Tumors of the spleen produce local
symptoms chiefly by reason of their pressure on, and inter-
ference with the functions of, neighbouring parts ; and they
have been often observed, as may easily be understood from
the vascular connections of the organ, to be attended with
attacks of hæmatemesis, which have been followed by sud-
den reduction of the swelling.

The Pancreas has been often found affected with diffe-
rent organic diseases, perhaps chiefly in cases where other
organs were at the same time similarly affected; but the
symptoms have appeared at least as obscure, and the de-
gree of affection of the function of digestion at least as vari-
able, as when the liver has been organically diseased ; and
many of the symptoms, obvious in some cases, have evi-
dently proceeded from compression of adjoining organs, as
jaundice from obstructed gall-ducts, pulsation from com-
pressed aorta, pain probably from stretched or injured
nerves, &c.

IV. The Peritoneum is often affected with organic dis-
ease, dependent simply on previous inflammation. Adhe-
sions of different portions of intestines to each other, or
bands crossing and binding down different portions of the
canal, are often left by acute inflammation ; and from these,
although the general health be good, there will result oc-
casionally more or less derangement of the peristaltic
movements,—griping pains, or fits of colic, from any acci-
dental excitement of these movements; and attacks of in-
flammation, or even independently of much inflammation,
such attacks of violent pain and tenderness, with vomiting,
and depression of the heart's action, as may be fatal,—on oc-

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casion of strangulation, more or less complete, of a fold of intestine beneath any such preternatural adhesions.

It deserves particular notice, that such adhesions are very frequently found uniting the folds of the Ileum, or the Colon and Rectum, within the pelvis, to the ligamenta lata, and other appendages of the Uterus, when these parts have either been the seat of active inflammation, as frequently happens after delivery, or have become affected with organic disease, in which they compress and irritate, and excite the exudation of lymph on, the adjacent peritoneal surfaces.

From chronic Peritonitis, or from the deposition of granular lymph, with or without distinct inflammatory symptoms in the peritoneum, there results a thickened and irregular state of that membrane, sometimes partial, sometimes very general, often with intimate and close adhesions of intestines and omentum, sometimes with little or no adhesion. The state of hypertrophy of the muscular fibres, thus inclosed in an unyielding ease, is sometimes a result of this state of the peritoneum. In such cases, the pains, and often likewise the fits of nausea and vomiting, are less urgent, but more constant than in those last mentioned; the bowels often very costive, and this sometimes alternates with diarrhœa, and is generally attended with flatulent distention; the patient wastes, and the hardened intestines may sometimes be felt as a tumour, and dropsical effusion generally takes place before the strength is finally exhausted.

The peritoneum is likewise the frequent seat, especially in young and manifestly scrofulous persons, of tubercular accretions, sometimes apparently originating, or repeatedly aggravated, by inflammatory attacks, at other times, without such precursory symptoms; and indicated generally by symptoms similar to those of the chronic lesion last mentioned, but with the addition that the adventitious texture here attains a much greater size, and the whole abdomen is often greatly distended with solid matter. In some such cases, the effusion is of the encephaloid rather than the truly tubercular matter, and the growth is then much more rapid. But as it is always gradual, the functions of the

intestines, though more or less disordered, often continue to be performed after all parts of the canal have undergone much change of form and direction.

The Mucous Membrane of the alimentary canal, and glands connected with it, are often in a state of chronic thickening and of chronic ulceration, consequent on decided inflammation; but frequently also it is found, at different periods of life, affected with various forms of ulceration in cases that have been quite chronic, and where intractable diarrhœa has been the chief symptom; where no peculiar adventitious texture is found, and no distinct indications of inflammation have preceded the ulceration.

The adventitious textures, which are frequently deposited in the stomach and intestines, generally originate in the cellular texture uniting the coats to each other. These vary exceedingly, from simple thickening and induration of that texture, causing more or less of Stricture, to the formation in it of circumscribed tubercles, of Fibro-cartilaginous or Scirrhous tumours, or of Encephaloid or Melanotic masses. They generally lead, sooner or later, to ulceration of the mucous membrane immediately above them, and often to considerable distention of the alimentary canal above them, as compared with the part below them : they sometimes attain such size as to be felt through the integuments of the abdomen; when seated in the pharynx or rectum, they may be felt by the finger or bougie; when in the œsophagus, or at the cardia, they are known by the permanent impediment they occasion to the descent of food into the stomach, and frequent regurgitation of food; and when at the pylorus, by the pain and vomiting recurring regularly two or three hours after food is taken, and by nearly uniform obstinate costiveness. In these ways, some of the most frequent seats of these diseases admit of being ascertained almost with certainty.

When their existence is not thus ascertained, these organic diseases of the alimentary canal can hardly be distinguished from the effects of simple chronic inflammation of the mucous membrane. Their symptoms are of very va-

rious intensity, and often subject to remarkable remissions; but the most frequent and important are,—pain and anxiety; nausea and vomiting, increased by all ingesta, when their seat is in the stomach; painful and intractable, though seldom violent, diarrhœa when in the intestines; tenesmus, and frequently mucous and bloody stools, and alteration of the natural form of the feculent evacuations, when confined to the great intestines; obstinate costiveness, and tympanitic distention, with pain, vomiting, and sometimes ileus, when they attain such a size as nearly to close the passage; and progressive emaciation and debility in almost all cases.

They very often excite, or become complicated with, inflammation, acute or chronic, in the parts around them, even repeatedly before they are fatal; and in consequence of the adhesions thus formed, ulceration extending through all the coats of the stomach or bowels has often been found connected with organic diseases, but in which the contents had not escaped, and the usually fatal effects of perforation of these coats had been averted.

These are very generally diseases of advanced life; but one set of organs, necessarily connected with the functions of the bowels, the Mesenteric Glands, are very often organically diseased in children and young persons. The kind of affection is the deposition and growth of the common scrofulous tubercles in these glands—sometimes as a part of a more general deposition,—sometimes almost exclusively, —in some instances, with symptoms, and indications on dissection, of chronic inflammation preceding the formation of the tubercles—in others, without such indications—sometimes apparently depending on the previous formation of ulcers on the mucous membrane of the bowels at the parts corresponding to the affected glands,—sometimes when little or no disease of that kind accompanies it. The tubercles undergo changes almost exactly corresponding to those in the lungs, but few have, in general, passed into suppuration before death takes place. The local symptoms are generally obscure and equivocal; tympanitic distention and mucous diarrhœa are perhaps the most common; but the

gradual emaciation, paleness, and weakness, in a scrofulous habit, in early youth, and without adequate apparent cause, are generally sufficient to excite strong suspicion of the disease. The medullary sarcoma also occasionally affects the mesenteric glands, producing similar symptoms, but a more rapid progress. In adults it is not uncommon to find cartilaginous or bony concretions (*i. e.* hardened tubercles), or encysted tumonrs in these glands, without any symptoms having been observed which can be confidently ascribed to these lesions.

When not fatal by reason of the inflammations that are complicated with them, these organic affections of the digestive organs generally go on until the patient is so much weakened and exhausted that his death takes place nearly in the same manner as that caused by fasting.

In some constitutions, and especially in the case of mans children, it is important to be aware, that chronic affections of the bowels, especially those connected with ulceration, even partial, of the mucous membrane, or with disease of the mesenteric glands, are very apt to give origin to affections of the brain and nervous system; sometimes to sudden and transient disorders there, such as headachs, or fits of convulsion, but frequently also to strictly inflammatory affections there, ending in serous effusion. This is often to be ascribed, in part, to organic disease already existing in the head, or at least to a peculiarity of constitution, generally the scrofulous habit, which predisposes to disease of the brain; and when such predisposition exists, any irritation producing febrile action may have this effect. But many practical observers have thought the diseases of the Primæ Viæ, now in question, peculiarly effectual in exciting such nervous disorders.

The different kinds of Worms, so often found in the alimentary canal, and the origin of which is still obscure, the small worms called Trichuris (usually found in the cœcum), and Ascaris vermicularis (usually found in the rectum);—the long round worm (Ascaris lumbricoides) which usually infests the small intestines; and the jointed

tape-worm or Tænia, also found there, but more frequently in adults,—demand attention here, chiefly because of the effect of the irritation which they occasion, to excite symptoms of nervous disorders, and sometimes dangerous diseases of the Nervous System. The symptoms which they excite in the abdomen itself, cannot be distinguished with certainty from those which other irritations acting on the mucous membrane, or slight inflammation and ulceration, may occasion there; but from the action of the lumbrici in particular, epileptic fits, and more anomalous nervous affections have often evidently originated; and in some cases symptoms closely resembling those of hydrocephalus (*i. e.* inflammation in the brain) have been apparently excited in this way, and abated after the expulsion of the worms; while in others, the symptoms apparently originating in this way, have gone on to decided and fatal hydrocephalus.

V. The Kidneys are frequently the seat of organic lesions, some of which, as the serous cysts often found on their surface, or in their substance, or even cysts containing hydatids, seem to interfere very little with their function. But it has been lately ascertained by Dr Bright and others, that the most common organic lesion in these organs, already noticed, *i. e.*—the deposition of granular lymph, sometimes taking the form of tubercles, in their cortical or secreting portion, is always attended by two obvious changes on the urine,—a diminution of its specific gravity,—often to 1010 or less, from the natural standard of 1024, and an addition to it of albumen, which is made obvious by heating it; and these changes necessarily imply considerable diminution of the quantity of urea passing off in this way, even when, as is sometimes the case, the whole quantity of urine passed is somewhat above the average *.

The kidneys affected with such disease are often found somewhat enlarged; but in other cases, especially when the

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* See Dr Christison's paper on Diseased Kidneys, in Edinburgh Medical and Surgical Journal, vol. xxxii.; and Dr Gregory's ditto, vol. xxxvi & xxxvii.

affection is of old standing, they are found remarkably shrunk in size, and the glandular texture almost absorbed away, in like manner as that of the liver is from similar disease. In some of these cases, when the urine is light and albuminous, there is much hardening of the substance of the kidneys; but in others, when morbid deposits are found, the kidneys are soft and flabby, and in some there is general infiltration of whitish matter altering the colour of the kidney, without any intermixture of granular or tubercular corpuscles with their natural texture.

The local symptoms of such cases are often obscure, although many of them begin with inflammatory symptoms and pain of loins, and most of them are early attended with dropsical effusions. In some cases, notwithstanding that the altered condition of the urine continues, the patient is restored to tolerable health; but very generally, when the urine is light and albuminous, the health is much, although variously impaired, partly, as we may suppose, by a sympathetic affection of their organs, but chiefly because of the retention within the system of matter destined to excretion. There is a peculiar liability to inflammatory attacks of various parts, vomiting and diarrhoea frequently recur in some such patients, and different affections of the brain in others. Dropsical effusion in different parts often recurs, and in some cases goes to a very great extent; and in some there is ultimately serous effusion in the head, and death in the way of coma; and this perhaps especially when the urine has ultimately become very scanty, as well as of light specific gravity; in which case, it has been already stated that the urea has been found in the blood, and the disease therefore is almost identical with the Ischuria Renalis.

Various other morbid growths or alterations of texture have been seen in the kidneys, but their effects are less known; and some of them (e. g. the medullary sarcoma, sometimes found in the kidney, and connected with repeated hæmaturia) are often only a part of a more general disease; and the simultaneous affection of other parts may have been more concerned in the fatal event.

The ureters are sometimes permanently obstructed by morbid deposits (e. g. tubercular matter) in their own texture; sometimes by calculi descending from the kidneys, and impacted in them; but more frequently by tumors of some of the neighbouring viscera compressing them; and the effect of their obstruction and distention, in causing absorption of the kidneys, was already noticed. When both ureters are affected in this way, to such a degree as to cause wasting of the glandular substance of the kidneys, the symptoms of ischuria renalis must naturally be expected.

The Bladder of Urine, like the heart, undergoes changes of its structure much more frequently in consequence, of disease of its lining membrane, or of the passage leading out of it, than from morbid deposits in its own substance.

The inflammation of its mucous membrane (e. g. tha which results from injuries of the spinal cord) leads to thickening of its muscular fibres, and contraction of its cavity, which of course implies frequent irritation, and evacuation of the bladder; and the same results follow from whatever permanently irritates its inner surface, or opposes the exit of the urine; therefore from morbid growths which sometimes originate in its mucous membrane, from calculi lodged in it, from enlargement of the prostate, or stricture of the urethra,—causes of difficult excretion of urine which require to be carefully distinguished by manual examination, but of the diagnostics of which it is not necessary to treat here.

The disease of the prostate gland, which is common in advanced life, consists sometimes of mere enlargement, but often of a gradual change of its substance, similar to that which takes place in the cellular substance connecting the coats of the stomach and bowels, until it has assumed the appearance of a scirrhous tumor. The strictures of the urethra very generally result simply from lymph effused by inflammation immediately behind the mucous membrane; but in some cases this lymph is gradually altered, and becomes ultimately cartilaginous.

In some instances different kinds of morbid growths take place between the coats of the bladder, which impede its action, and lead likewise to thickening and contraction of the fibres not involved in the disease.

These organic affections of the urinary organs cause much and frequently recurring pain, and other uneasy sensations; and thereby become attended with much sympathetic affection of the functions of other parts, often especially of the stomach, and with more or less of the fe·brile state ;—often also with inflammation and its consequences in the parts immediately adjoining those most altered by disease; and they appear to be fatal by reason of the debility and emaciation thus produced, much more than by reason of the absorption of the urine, the evacuation of which is thus impeded.

VI. The Organs of Generation in both sexes are very liable to organic disease, as may be expected from their full supply of blood, and from their habitual excitement by changes in the nervous system. Of this, the frequency of disease of the prostate is one example; and the testes are liable likewise to various morbid changes, particularly to depositions in their substance of the nature of vascular sarcoma, of tubercles, or of medullary sarcoma; and in advanced life to the true scirrhus ;—all these affections, in this as in other parts, often beginning from injury or inflammation, sometimes gradually taking place without obvious cause. These last changes, when they are the effects of constitutional disorder, or when they.have lasted so long as to affect the constitution at large, are often attended, not only with much pain, but with fever, taking somewhat the form of hectic, great debility, and emaciation; and ultimately may cause death by exhaustion.

The uterus is still more liable to organic changes than any of the male organs of generation, the nature of which may often be ascertained by examination, or known almost with certainty by the state of the symptoms during life. These may be reduced to the following heads.

1. Within the cavity of the uterus, various morbid formations may take place on its mucous membrane, by some of which it may be distended, and even its cervix expanded, as by the development of the fœtus. The simplest in its mode of formation, appears to be the tumor occasionally seen there, which consists of layers of partially decolorized crassamentum of blood, like the contents of an aneurism, formed by a morbid alteration of the menstrual excretion, and apparently, from the increase of uneasy feelings at stated intervals, receiving an increase of bulk at the menstrual periods. The next in point of simplicity are the polypi, often growing within the uterus, and projecting into the vagina; which seem in some cases to originate likewise in coagula of effused blood, and which are usually attended with frequent and profuse hæmorrhage. Again, in some cases a mass of hydatids, and in others a single sac containing a serous or bloody fluid, has been found to occupy the cavity of the uterus, and the contents of such sac have been repeatedly discharged by the vagina. And in unhealthy constitutions masses of the encephaloid matter have also formed here, perhaps in some instances by transformation of effused blood.

2. In some instances the muscular substance of the uterus has been found preternaturally hard, and in others preternaturally soft, without decided previous inflammation; and in many cases ulceration, beginning on the mucous membrane at the os tincæ, gradually pervades the organ, causing purulent and fetid discharge, with very little of inflammatory symptoms, and with no deposition of adventitious textures preceding it.

3. Different adventitious textures are often deposited in the substance, or even originally just beneath the peritoneal coat of the uterus. Of these the most common are the Fibro-cartilaginous tumors, which although often closely resembling the true scirrhus in structure, yet, when growing quite distinct from the natural textures, may be found in considerable numbers, attain a great size, last long perfectly inert, and cause no symptoms, excepting what

may result from their pressure on the adjoining parts;—the medullary sarcoma, and the true scirrhus, both of which are more intimately intermixed with the muscular texture, and sometimes with each other in the same subject. These are first deposited at the os tineæ and cervix uteri, causing enlargement, irregularity, and generally hardness of these parts; and go on to ulceration, beginning at the os tineæ, causing much fetid discharge, and infallibly spreading through the substance of the organ; frequently spreading likewise through the coats of the rectum or bladder, so as to establish unnatural communications; and sometimes through the peritoneal covering of the uterus, so as to allow the escape of the morbid secretion into the cavity of the abdomen, and excite rapidly fatal peritoneal inflammation.

These last diseases sometimes appear to commence with inflammatory symptoms, or at least with increased determination of blood to the uterus, denoted by uterine hæmorrhage after the period of the cessation of the menses, before any puriform discharge begins; but such symptoms are not always observed, and even when they are, it may often be suspected, that an unperceived perversion of the nourishment of the part had preceded their appearance; they are attended generally with severe pain, referred to the back and lower limbs, as well as to the pelvis; but liable to great and long continued remissions; and with rapid sinking of strength, frequently febrile symptoms, and ultimately extreme emaciation.

In regard to all organic diseases of the uterus, it is to be remembered, *first*, that they are very generally attended with various sympathetic sensations, and with sympathetic derangement of the functions of other parts, particularly the stomach; and *secondly*, that many of the symptoms that are very urgent in such cases may depend on the pressure of the diseased and enlarged uterus on the neighbouring parts, and on the chronic inflammation excited, and unnatural adhesions frequently, though not uniformly, formed among these; especially, as was already stated, when the morbid growth is of a malignant kind (p. 240). Thus dysuria

from such affection of the bladder, dysenteric symptoms from such affection of the rectum, in some instances disease of the kidneys from distention of the ureter, and in many colic pains, constipation, vomiting, &c. from adhesions of the folds of ileum in the pelvis, combine themselves with those of the diseased uterus. In some instances, symptoms also arise from the enlargement, and degeneration of lymphatic glands within the pelvis, consequent on such diseases of the uterus, e. g. anasarca of one or both of the lower extremities from pressure on the iliac veins.

In some instances, the Fallopian tubes are distended by serous cysts; or these tubes, and the broad ligaments of the uterus, are beset with different kinds of morbid growths, which may have effects on the adjacent viscera, similar to those just now described.

The most common disease of the Ovaria is the formation of encysted tumors (generally several in one ovary) which appear sometimes to commence as serous cysts, unconnected with the sound texture of the organ, but frequently are formed by the distention of the Graafian vesicles, and which often attain an enormous size. The contents of these are very various even in the same ovary; serous, gelatinous, atheromatous, or purulent; and in other instances, blood, more or less altered from the sound state, encephaloid matter, or melanosis. In other cases sarcomatous, fatty, or fibro-cartilaginous tumors form in and project from the ovaries; and in some, these different morbid growths are found combined. Many of these may subsist long, and cause no symptoms but what depend on their situation and size, and pressure on adjoining parts; but when the encephaloid or melanotic matter is deposited, the general health is always much impaired, and in the former case especially, there are often repeated attacks of inflammatory symptoms, followed by increase of the tumors.

VI. Almost every known variety of organic disease has been repeatedly observed to affect the contents of the Cranium, and almost all have appeared in some cases to origi-

nate in an inflammatory attack (*e. g.* from an injury) and in others have seemed merely results of perversion of nutrition, without any such precursor. The bones of the cranium are sometimes found of unusual thickness, and appear to have compressed the contents; exostoses from the inner table, and sometimes tumors, even passing inwards through the bone, from the pericranium, have been found to compress and irritate parts of the brain. The dura mater has been found partially thickened, ossified, or beset with tubercles or other kinds of tumor. Attached to the pia mater on the surface, or to the membrane continuous with it in the ventricles, or detached from any of the membranes in the substance of the brain, we often find scrofulous tubercles, especially in younger subjects, of very various number, and in various stages of progress, sometimes the medullary sarcoma, or other morbid growths of the kinds which affect the general habit; sometimes more isolated tumors, and these either encysted and containing serum (as is frequently seen in the choroid plexus), or blood; or of the class described as sarcomatous, and answering to the description of ceroma, or chondroma, or fibro-cartilaginous, or even bony. We have also examples of injurious effects on the brain, evidently resulting merely from a diseased state of the vessels, enlargement or aneurisms of the arteries, or partial obstructions either of these or of the sinuses from diseases of their lining membrane, without rupture.

Again, besides the hardening and softening of the substance of the brain, which were described as effects of inflammation, either more acute or more chronic, we meet with some examples of both those changes of consistence in portions of the brain, without change of colour, or any clear evidence of inflammation; and in other cases, with the hypertrophy, formerly described, of the whole cerebral substance, or more partial atrophy of the nervous matter. Along with almost all these organic lesions within the cranium, serous effusion into the ventricles is often found, and sometimes also suppuration, or other marks of recent inflammation.

Now, all that can be said with confidence as to the symptoms attending and denoting this great variety of organic lesions within the cranium, may be briefly expressed thus:

1. A great variety of these have certainly existed, and probably for a length of time, in some cases, without causing any such derangement of the functions of the brain, as attracted any attention;—certainly without causing so decided derangement of these functions as has often been observed in cases where, on dissection, no morbid alteration of structure could be detected.

2. In a much greater number of cases these organic lesions, as well as those which result directly from inflammation within the head (*i. e.* effusion of serum and of lymph, abscesses, yellow or red softening of the cerebral substance), have been found connected with derangement of some department of the functions of the Brain,—of Sensation, of Thought, or Voluntary motion; but the seat of the lesion has no ascertained connexion with the function deranged farther than this, that any paralytic symptom is generally in the opposite side from the affected part of the brain, and that a lesion near to the origin of a nerve may be expected to affect the function of that rather than of a distant nerve*.

3. The symptoms found in connexion with these organic lesions of the brain are sometimes quite chronic, and nearly unchanged for a great length of time, *e. g.* constant dull pain of head, or of part of the head, constant vertigo, intractable nausea and vomiting and consequent emaciation, amaurosis, deafness, loss of sensation or of voluntary power, or both, over one side of the body, or in a single limb, continually recurring spasms of particular muscles, loss of memory, general or partial, *e. g.* loss of the meaning of words, or that of substantive nouns), insanity general or partial (*i. e.* characterized by erroneous belief or delusions, either

* Cases have occurred to myself sufficient to shew, that no reliance can be placed on the supposed connexion of disease of the anterior lobes with palsy of the tongue, or with loss of the memory of words, of the corpus striatum with palsy of the lower, or of the thalamus with palsy of the upper, extremity.

on almost all subjects, or on certain subjects only) ; or even partial or total imbecility or fatuity.

4. In many of these cases, such organic lesions have been found in connexion with violent symptoms recurring only occasionally, and leaving intervals, either of perfect health, or of some of the less violent and more permanent affections of the nervous system ; *e. g.* they have often been found connected with fits of epilepsy, *i. e.* of convulsion with insensibility, or with fits of transient insensibility without spasms, or with fits of mania, or melancholia, or with fits of violent headach, or vertigo, or other uneasy sensations affecting the head, with which nausea and vomiting are often combined.

5. In other cases, these organic lesions are found after an attack of fatal coma, preceded by more or less of febrile and inflammatory symptoms, which had either supervened on some of the more chronic diseases above mentioned, or occurred without previous ground for suspicion of cerebral disease; and in many, there is a combination or succession of several of the sets of symptoms, acute or chronic, in the same person.

In order to form some conception how so great variety should exist in the symptoms connected with these organic lesions of the brain, it is necessary to recollect the following principles.

1. Nervous matter may be totally unfit for its functions in the living body, although possessing quite its usual structure and appearance, and duly supplied with arterial blood; as we learn from some cases of amaurosis, or of palsy, unconnected with any perceptible alteration of the nerves or brain; and again, nervous matter may undergo considerable change of form and appearance, if slowly and gradually effected, and nevertheless continue to perform its functions; as we learn particularly from some observations on diseases of the spinal cord. From these facts it evidently follows, that parts of the brain apparently somewhat diseased may still be susceptible of the changes which attend the exercise of sensation or thought, and again, that

portions of nervous matter may be disqualified for their func-
tions by such organic diseases, although situated at some
distance (and in a direction which we have no means of
ascertaining) from those which are the most obviously dis-
eased. And in fact, it was already stated, that it is only
by deranging the functions of nervous fibres at some dis-
tance from itself, that any lesion of parts superior to the
medulla oblongata can cause either palsy or convulsion *.

2. Any such organic disease must necessarily confine
and disturb the circulation within the head, and there-
fore will necessarily act as a predisponent cause of those
diseased states which may be excited, either by sudden de-
termination of blood to the head, or by sudden diminution
of the flow of blood thither;—which causes are certainly
often concerned in producing the more temporary diseases
above mentioned as connected with these organic affections
in the brain.

3. Such organic affections must also evidently act as a
great predisposing cause of inflammatory action within the
cranium, which may be generally supposed to have occur-
red, not only when decidedly inflammatory effusions are
found, but whenever there is reason to believe that a rapid
serous effusion has taken place, especially if preceded by
violent pain and febrile symptoms.

It will readily be understood, that it is chiefly by the
great predisposition given to these more acute diseases,
that the organic lesions of the brain produce fatal coma;
although in some cases, the more chronic and uniform
symptoms which they excite pass insensibly into coma
without inflammatory symptoms, and without any effusions
that can be ascribed to inflammation appearing on dissec-
tion.

The contents of the canal of the vertebræ, and the nerves,
are liable to organic lesions corresponding to those described
in the contents of the cranium, and with similar effects,
often well marked, but likewise variable, in the functions of

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* See Physiology, p. 132.

the spinal cord and nerves. When the spinal cord is extensively and seriously injured by disease, the action of the organs of circulation is gradually enfeebled *, and death may ensue apparently from this cause, independently of the accession of coma. Tumours growing within the sheaths of nerves, and separating their fibres, cause intense pain (liable, however, to remarkable remissions), although of no malignant nature.

VII. The muscles of voluntary motion are but little liable to organic changes of structure, excepting to such as they undergo in consequence of disease of neighbouring parts, common with other textures, and where their affection forms no essential part of the danger to be apprehended. But other organs of locomotion, especially the Bones, and the different textures about the Joints, are liable to a great variety of morbid changes, several of them certainly dependent on inflammation in the first instance, but which go on for a length of time after all the effects of mere inflammation are at an end, and admit of no benefit during the greater part of their progress, from the remedies for inflammation. These are sometimes only attendants of other morbid actions in the body (as in many scrofulous cases), which are more immediately dangerous than themselves; but in many cases also, they are dangerous in themselves, either by reason of the constitutional disorder (taking more or less the form of Hectic Fever) which they excite, or by reason of the injury which the alteration affected in the bones necessarily inflicts on the parts adjoining to, or contained within them. Of these organic changes the following are the most important.

1. There is a great and general perversion (as has been already stated), of the nutrition and growth of bones in Rickets,—a state occurring chiefly in scrofulous habits, and produced by the same causes as determine the formation of the scrofulous diathesis; in which the bones are not only deficient in earthy matter, but do not acquire their usual structure; their cellular texture is less compact than na-

* See p. 9.

tural; the contents of the cells gelatinous instead of being medullary; and the medullary canals are not formed in the interior of the long bones, while the extremities of these bones acquire an unnatural size. Such irregular depositions of phosphate of lime sometimes happen *, as shew that the quantity contained in the system is not deficient, and that the fault lies in the vital powers and affinities, by which the nourishment of this texture is appropriated. And accordingly, the disease is often checked, not by the addition of earthy matter to the ingesta, but by a general tonic mode of life. The altered form of the bones in this disease, and particularly the depression of the sides of the chest, compress the viscera, and give necessarily a great predisposition both to inflammation and to organic diseases there, even independently of any simultaneous scrofulous disease; and the change thus effected on the bones of the pelvis often renders parturition difficult or impossible.

2. Besides the simple increase of osseous substance consequent on inflammation, and besides the simple Caries or ulceration, the Exfoliation consequent on the death of the external layers of bone, from inflammation, or from destruction of the periosteum, and the Necrosis consequent on the death of the internal layers from similar changes in the medullary membrane,—there are many more varied local alterations of the nutrition of bones and joints, which may be traced, for the most part, to diseased action in the lining membranes, external or internal, of the bones, or in the synovial membrane of the joints. These are seen chiefly either in cases where there are indications of scrofulous disease, or in syphilitic cases; very often where there are clear indications both of previous syphilis and previous scrofula; and in scrofulous habits, they are certainly often aggravated by the use of mercury, perhaps chiefly by its indirect agency in predisposing to aggravations of scrofulous disease, after its own influence on the system is over. The most important of these are,

1. The different kinds of Exostoses, or hard tumours growing on bone, some simply bony, some cartilaginous,

* See WILSON on the Bones and Joints, p. 164.

some containing bony matter irregularly diffused through them (osteo-sarcoma), and of these some containing an albuminous matter in their interstices, and others the matter of fungus hæmatodes ; some likewise covered by periosteum, and smooth on their surface, while others are denuded by ulceration of the periosteum, and rough on their surface, from irregular attendant absorption or caries.

2. The great enlargement and expansion of the cells of the bones, chiefly of the short bones or extremities of the long ones, which appear to be produced by various morbid growths on the medullary membrane, in their interior, distending them, and causing irregular absorption of their substance, generally causing likewise severe pain, as in the Spina Ventosa, or what has been called the Medullary Exostosis; and even, in the opinion of some, in the Mollities Ossium of adults, where the disease appears to consist (at least in the parts most affected), in the substitution of a morbid secretion from the medullary membrane, or of a morbid mass formed from effused blood there, for the bone which is absorbed, rather than in mere alteration of the composition of the bone.

3. The Ulceration and Caries beginning in the cartilages, and extending into the bones of the joints, with or without deposition of tubercular matter into their cancelli, which are most common in the hip-joint, and cause much pain and constitutional disturbance before there is much alteration of the form of the joint.

4. The altered condition of the synovial membrane of joints, causing much swelling and alteration of their form, which seems to be the fundamental change in most cases that are called White Swelling of the Knee; which gradually becomes complicated with disease of the other textures of the joints, but is attended at first with little pain, and which was formerly noticed as equally characteristic of scrofulous disease as the scrofulous tubercles themselves *.

* Both these last changes may supervene on simple inflammation of the synovial membrane of the joints, but often take place independently of any such acute disease in their commencement; and even chronic inflam-

5. The softening and Caries, generally attended with tubercular deposition, in the bodies of one or more of the vertebræ (affecting, and sometimes beginning in, the intervertebral substances), which cause pain, tenderness, and protrusion of their spinous processes, and have the name of Morbus Dorsalis.

The following general facts demand attention in regard to these local diseases of the bones and joints.

1. They become very generally attended, during their progress, with inflammation and suppuration in the neighbouring soft parts, by which their symptoms are rendered more complex, and their danger often increased; and these are not to be ascribed to mechanical pressure from enlarging parts, but are sympathetic effects, similar to the inflammation often excited in the gum or in the check, in toothache, by a diseased action originally seated in the pulp of the tooth; and probably depending on irritation of the nerves of the diseased parts affecting other sentient extremities of the same nerves.

2. The portions of bones destroyed by caries, in such diseases, cannot be regenerated in their natural form; but, in cases where the constitution suffers less than usual, and which end favourably, fresh bony matter is thrown out, in an irregular form, as the morbid secretions disappear; which takes the place of the different textures that have been destroyed, and often constitutes the union by Anchylosis, either of the articulating ends of bones or of the bodies of vertebræ.

3. All these processes necessarily impede, or even wholly prevent, the exercise of the functions of the parts affected in locomotion, and several of them, especially such as originate in the interior of bones, are attended with severe pain; and with such constitutional disturbance as may produce death in like manner as internal suppuration and ulceration do. In several of these likewise, symptoms are

mation of the synovial membrane does not necessarily lead to any such changes, its effects being often confined to fluid effusion into the joint, and thickening of the capsular ligament, and consequent stiffness.

often produced, which depend on the compression or irrita-
tion of parts of the nervous system; *e. g.* the pain of the
knee from disease of the hip-joint, the pain stretching round
the abdomen from disease of the vertebræ; but especially
the palsy of the lower limbs and lower part of the trunk, and
consequent retention of urine, apparently from loss of sen-
sation, and afterwards incontinence of urine from inflam-
mation of the mucous membrane of the bladder, and irrita-
tion of its muscular coats *, and frequently also, the gan-
grene of the nates from pressure,—in cases of extensive
caries of the vertebræ. These effects are to be ascribed, not
to the mere incurvation of the spinal cord, by the change
of form of the canal, but probably in every case to actual
injury of the cord, either by the disease extending to its
membranous coverings, or by the pressure of displaced or
detached bone.

VIII. In more external parts of the body, there are vari-
ous well known diseases depending on organic changes,
which it appears sufficient merely to enumerate.

1. The cornea acquires an increased size, and becomes
almost perfectly opaque in the Staphyloma of children, of-
ten consequent on, but certainly not a simple effect of
ophthalmia; and the crystalline lens of the eye is gradually
converted into an opaque mass, sometimes of more, and at
other times of less consistence, constituting the different
forms of Cataract which obscure or extinguish vision in
many persons advanced in life.

2. At various periods of life Polypi form on the mucous
membrane of the nostrils, which are somewhat various in
texture, seldom become attended either with hæmorrhage
or ulceration; but often cause much uneasiness, and im-
pair both the sense of smell, and the passage of air.

3. There are various diseases of the skin (of the class
termed Tubercular by WILLAN) which consists in increased
and perverted nutrition of the texture, of which the most
striking example is the Elephantiasis, endemic from un-

* See Physiology, p. 113 and 115.

known causes in some countries, and existing occasionally,
and as a more local disease in others; attended with, and
always aggravated by, repeated attacks of erysipelatous in-
flammation, but not necessarily originating in such inflam-
mation, and differing widely from its usual products.

4. The subcutaneous cellular membrane, and the portions
of the same texture which penetrate among the muscles
and external glands, and extend to the bones, are a fre-
quent seat of encysted or sarcomatous tumors of all varie-
ties.

5. The subcutaneous lymphatic glands are very fre-
quently in scrofulous persons, and in cold and moist cli-
mates, the seat of tubercles, sometimes apparently origi-
nating in inflammation, but often growing slowly with-
out pain, exciting inflammation around them when they
have attained a considerable size, and then passing into
partial suppuration and slow ulceration. These are some-
times so general over the body as to be attended with hec-
tive fever; but much more generally they are dangerous
only as indications of the diathesis, from which scrofulous
affections of more important organs are to be apprehended.

6. Various parts situated externally, the lips, the tongue,
the lymphatic glands, but above all the mammæ, are liable
in persons advanced in life, to the formation of tumors,
with or without known cause; which either have from the
first, or gradually acquire, the character of true Scirrhus, ex-
tending to the adjoining parts, causing paroxysms of severe
pain, becoming attended with much weakness and emacia-
tion, and passing ultimately into intractable and exhaust-
ing ulceration.

CHAPTER XI.

OF DISEASED STATES OF THE EXHALATIONS.

WE here treat of Dropsical Effusions, and of certain other cases of disease, where increased and somewhat altered Exhalation into the shut cavities, or cellular membrane (without any of the effusions characteristic of inflammation), is the most essential part of the morbid change, and often the immediate cause of death, by Coma or Asphyxia. These are most generally, however, consecutive on other diseased states, often parts of very complex diseases; and after what has been said of inflammation, and of congestions of blood, as causes of serous effusions, and likewise of obstructions to the free movement of blood, especially in the veins, as a great predisposing cause both of inflammation and congestion, we need not dwell at any length on the pathology of Dropsy.

We mentioned formerly two cases in which serous effusion, consequent on mere inflammatory action, without any obstruction to the return of the venous blood, may be fatal, viz. the common case of rapid effusion of serum into the ventricles of the brain; and the rare case of pneumonia, affecting both lungs at once, and fatal by serous effusion into the cells of the lungs, before any but that first effect of inflammation has taken place.

In the case of Hydrocephalus, and probably in the case of acute Œdema of the lungs also, organic disease of the organ affected very often exists; and, by confining and disturbing the circulation, is no doubt concerned in producing the effusion; but it is not such organic disease as necessarily obstructs the flow of the blood in the veins.

That the cause of the œdema of the lungs in a case of this last kind, is inflammation of the lungs, we infer from the symptoms, local and general, being those of pneumonia,

rapidly fatal, and from the appearances (redness, with co-
pious serous effusion), being just the same as we see in or-
dinary cases of pneumonia, in the portions of lung imme-
diately adjoining that which is most severely inflamed.

That the serous effusion into the ventricles of the brain,
in the acute Hydrocephalus, common in children, especially
f scrofulous, is to be ascribed to an increased determina-
tion of blood, approaching, if not amounting, to inflamma-
tory action, we infer chiefly from these facts,

1. That the combination and succession of symptoms, in
cases of that kind, fever, acute pain of head, nausea and
vomiting, impatience of light and sound, followed by slow
or irregular, and then very quick pulse, by delirium, con-
vulsions, dilated pupil, squint, and double vision, and fatal
coma (although admitting, as the symptoms of all diseases
do, of some modification in different individual cases), are
the same as are met with in many cases where, either from
injury or other causes, unequivocal inflammation of the
brain or its membranes takes place, and its effects are seen
on dissection.

2. That, in cases of this decided inflammation of the
brain, besides inflammatory effusions, softening of the brain,
&c. serous effusion into the ventricles is almost invariably
found; while, on the other hand, in cases usually called
Hydrocephalus, where the chief appearance is the serous
effusion, strictly inflammatory appearances, to a small ex-
tent, very often exist.

3. That when the symptoms of the first stage of hydro-
cephalus are treated by the active antiphlogistic remedies,
particularly by general bloodletting and full purging, the
blood often shews the buffy coat, and the progress of the
disease is often successfully arrested.

Again there are many cases of fatal Coma in adults, some
very rapid, and others slow in their progress,—some pre-
ceded by no premonitory symptoms, others by all possible
varieties of alteration in sensation, thought, and voluntary
power,—where nothing but serous effusion is found, but
where no decided febrile or inflammatory symptoms have pre_

eeded the fatal coma, and which have the name of Serous Apoplexy; in such cases likewise, the precise resemblance of the symptoms to those in which hæmorrhage is ascertained to have taken place, and the experience of the juvantia and lædentia, entitle us to say that the effusion is generally to be ascribed to increased determination and congestion of blood, although no obstacle to the return of the venous blood may exist *.

The Hydrocele, or dropsy of the tunica vaginalis testis, is another case, often referable, in the first instance, to an inflammatory action, as when it is excited by a blow, and although naturally favoured by the position of the part, not distinctly referable to obstruction of the venous circulation.

In other cases, dropsical effusions are apt to go on to a greater extent than in these, and perhaps in all others some impediment exists, if not to the flow of blood in the veins, at least to its free movement in some part of the system, which retards the capillary circulation in some considerable surface, and favours the escape of more than usual of the serous part of the blood.

In general, in dropsical cases, the vital actions in the vessels which yield the effusion have not undergone any change in *kind*, as they necessarily have in cases of inflammation; but the natural action of Exhalation from these vessels predominates over that of Absorption; generally on account of some impediment to the return of venous blood from them, situated at some distance from themselves, but causing congestion and retarded flow in them, and facilitating transudation from them.

There are some cases, even of general dropsy, where no such impediment to the circulation can be detected, but such cases are in general slight and easily removed, unless they occur towards the close of a long continued disease,

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* It is worth notice, that although, in the natural state, the serum within the ventricles, and that beneath the arachnoid, communicate by the opening at the extremity of the fourth ventricle; yet, when the ventricles are considerably distended, this opening appears to be closed by the apposition of its sides, and the surface of the brain is generally drier than natural.

which is dangerous in itself. The truly important distinction among dropsies is according to the nature and seat of the local disease, obstructing or impeding the circulation, with which they are connected; but it is of course necessary likewise to ascertain, as far as possible, in every case, what cavities are occupied by the effusion.

Anasareous or œdematous swellings, dependent on effusion into the subcutaneous cellular membrane, are easily known by their soft feel, without discoloration, and by pitting on pressure; and the Ascites, or effusion into the cavity of the abdomen, by the sense of fluctuation felt with our hand when the abdomen is gently struck by the other, particularly if this is most distinct in whatever part of the abdomen is lowest in the position of the patient.

The effusion into the cavity of the Chest is not so easily discriminated, especially as it is very often only a part of the cause of the dyspnœa, and other general symptoms, which are present; and when it occupies both sides of the chest, it may be a cause of considerable dyspnœa, without going to such an extent in either as to be distinctly ascertained by examination. But in many cases, the dull sound on percussion, and obscured, or even suppressed respiratory murmur, in whatever part of the chest is lowest at the time of examination, and the disappearance of these symptoms in that part, when it is made highest, sufficiently denote the disease.

The dropsy of the Pericardium, when unattended with any strictly inflammatory effusion, seldom exists without dropsy in other parts of the chest, and other disease within the chest; its diagnosis is uncertain, but when considerable it causes a dull sound on percussion; makes the heart's action feeble and irregular, with variable and perhaps undulating impulse; and the recumbent and especially the supine position insupportable.

In many cases dropsical effusion, though without inflammatory symptoms, takes place into the cells of the Lungs, more than into any other part within the chest. In such the sound on percussion is hardly sensibly altered; but the

respiratory murmur at the part that lies lowest is obscured, and sometimes the râle crepitant or sous-crepitant may be perceived; but as this case is generally complicated, at least with bronchitis, causing the sonorous and mucous râle, the diagnosis is generally difficult.

The increase of dyspnœa on lying down, although often a striking, is neither a uniform nor characteristic, symptom of any serous effusion within the chest; and the starting from sleep is certainly not an effect of this effusion, depending generally, when it is observed, on concomitant disease of the heart. But the presence of anasarca, and of scanty urine, especially if these can be ascertained to have been contemporaneous with the attack of dyspnœa, always give great reason to suspect that effusion exists; there being few cases of any considerable dropsy either of the thorax or abdomen without these symptoms.

The internal parts, with disease of which dropsy is most naturally connected, with the symptoms of which, therefore, its indications are most frequently combined, are, the Heart, the Lungs, the Liver, and the Kidneys. The effect of such organic diseases as have been described, or of inflammatory effusions, at the heart, at the lungs, or at the liver, in retarding the flow of blood in the great veins, either the venæ cavæ, or the vena portæ, requires no illustration. When the kidneys are diseased, although no great veins be affected, the natural outlet of part of the serum of the blood is more or less obstructed. The chronic diseases already mentioned, of the peritoneum and of the mesenteric glands, are likewise frequently attended with dropsy, probably by reason of pressure on some of the mesenteric veins. And in a large proportion, especially of the worst cases, dropsical effusion is connected with simultaneous disease of two or more of the parts above mentioned. The following appear the most important principles to be kept in mind, regarding its connection with the diseases of these parts.

1. It is not a uniform, and therefore not a necessary consequence, of any disease that we can specify in any one of these parts; and the chronic diseases of them, on which

it so frequently supervenes, may be regarded simply as
great and permanent *predisponent* causes of it. When that
predisposition (dependent on a more or less obstructed state
of the circulation) exists from chronic disease of one of
these parts, an acute disease, although slight, of another of
these, or even a general disturbance of the circulation, is
often the exciting cause of the first accession, or of the sub-
sequent returns of dropsical effusion ; and the greater the
amount of the permanent predisposition, and the more fre-
quently the dropsical effusion has recurred, the less action
of any exciting cause is necessary to reproduce it. There
are, however, cases of peculiar tendency to dropsical effu-
sion, the cause of which is quite obscure.

2. Inflammation of the heart, of the lungs, or of the kid-
neys, appears in some cases to excite dropsical effusion,
when no other disease of internal organs exists. This we
conclude from the dropsy, whether general or partial, su-
pervening almost immediately on the usual symptoms of
inflammation of these parts ;—or, in the case of the kidneys,
from its being attended with the albuminous urine, of low
specific gravity, and taking place suddenly, generally from
exposure to cold, and with febrile symptoms ; which com-
bination of circumstances, although there be little or no
local pain, may be held to be a sure mark of such an in-
flammatory action at the kidneys, as tends to the disease
of their secreting texture formerly described (p. 235).
Such cases have the name of Acute or Inflammatory Dropsy.
But in most cases of dropsy supervening so rapidly on in-
flammation of any one of these organs, it will probably ap-
pear, on careful examination, that another of them is at least
slightly inflamed also ; *e. g.* that some degree of pneumonia
or bronchitis attends either the acute dropsy with coagulable
urine, or that which is apparently owing merely to inflam-
mation at the heart.   The acute dropsy after scarlatina is
generally attended with coagulable urine, and may there-
fore be supposed to depend on subacute inflammation of
the kidneys, coinciding with the obstructed state of the ex-
cretion at the skin.   But in severe cases of this kind, in-

flammation within the thorax is very generally present likewise.

3. When the permanent predisposition, resulting from organic disease of any one of these organs, exists, it is important to be aware of the nature of the fresh attacks of disease, from which attacks of dropsy are most to be apprehended.

a. Most of the attacks, in this description of patients, which take place *suddenly*, especially if attacks of general dropsy, appear to depend on an inflammation, often of no great intensity, in the lungs or bronchiæ, (which will necessarily be attended with some acceleration of the pulse, and at the same time with some impediment to the flow of blood through the lungs); supervening either on disease in the left side of the heart,—or on permanent organic disease (*e. g.* partial condensation from previous inflammation) of the lungs themselves, or on an obstructed state of the liver or kidneys.

b. There are other cases in which pretty acute, but more partial, dropsy supervenes on these chronic and organic diseases, and where its immediate cause appears to be a subacute inflammation of the membrane where the effusion takes place, generally the pleura or peritoneum; and in some such cases, on dissection, a few flakes of adhesive lymph are found mixed with the serous effusion; the affection of the serous membrane evidently commences as inflammation, but an unusual amount and duration of serous effusion, consequent on that inflammation, is determined by the existing organic disease which retards the venous circulation.

c. When dropsy supervenes more slowly on organic disease of the heart, it may often be ascribed, in part, to the accession of chronic bronchitis, to which it was formerly stated, that any obstruction on the left side of the heart gives a great predisposition. In this case, the effusion into the cells of the lungs is perhaps fully as common as that into the cavity of the chest.

d. When dropsy, especially if ascites, slowly supervenes

on chronic disease of the lungs (*e. g.* on old asthma and em-
physema), the reason generally is, that the liver has become
hardened and obstructed *.

Here it should be observed, that as hydrothorax, or ge-
neral dropsy, from disease within the chest, is more fre-
quently, in part, dependent on a temporary remediable cause
(*e. g.* bronchitis) than ascites from disease of liver, so it
is more frequently seen to abate under remedies.

e. Dropsy with diseased kidney is probably more variable
than that dependent on any other cause— often abating en-
tirely, without any improvement of other symptoms.   And
there is this peculiarity attending it, that the bulk of the
urine passed in the day is sometimes fully as great as na-
tural; and in some instances is raised by medicines consider-
ably above what is natural, for some time together, without
diminution of the dropsy ; whereas in other cases of dropsy,
a full flow of urine, though often a temporary, is a certain
cause of absorption of the effused fluid.

4. As a certain degree of retardation of the motion of the
blood seems essential to dropsical effusion, it is easy to un-
derstand, that while on the one hand it is favoured by such
a degree of fulness of blood, as increases the effect of any
mechanical impediment to the circulation (and is more apt
to supervene, therefore, on a given amount of obstruction
at the heart in a young and strong, than in an old and fee-
ble subject),—it must also, on the other hand, be favoured
by such a state of weakness as hinders the blood in the ca-
pillaries from receiving their due impulse from the action
of the heart ; and therefore should often gradually supervene
in the later stages of diseases where any organic obstruc-
tion exists, although absent in the earlier stages; and should
in some such cases be apparently promoted by evacuations of
blood.   The effusion into the cells of the lungs, in particular,
is apt to occur, in a greater or less degree, in circumstances
of extreme debility, from whatever cause that may arise.

Dropsical effusion is always injurious to the vital power
of the capillaries in its immediate neighbourhood, the cir-

culation in which must necessarily be impeded by the pressure of the effused fluid; as is distinctly shewn by the coldness of dropsical limbs, and still more by their peculiar tendency to gangrene when inflamed. In this way such effusion in the abdomen must necessarily impede the functions going on there, and so co-operate towards the fatal event of cases where it occurs. In the thorax it is frequently the cause, or great part of the cause, of death by Asphyxia. And it is also to be observed, that when much dropsy, especially within the chest, exists, even independently of disease of the heart, sudden death is not uncommon. Lastly, in the course of dropsical diseases, effusion not unfrequently takes place in the ventricles of the brain, and causes fatal Coma; and this sometimes unexpectedly, without increase of the other dropsical effusions.

There are many cases of partial dropsy, as, e. g. of the lower limbs, evidently explained by compression, or some mode of obstruction, of the larger veins leading from the part, as by enlarged lymphatic glands. The most remarkable case of the kind is the phlegmasia dolens, or great swelling of the leg and thigh, painful, but without discoloration, occasionally seen in women after delivery, and which has been ascertained by Dr Davis, Dr Lee, and others, to proceed in some cases, and may probably proceed in all, from inflammation in the uterine veins, extending to the iliac veins, and causing effusion of coagulable lymph, by which they are plugged. But in this case the serum effused into the cellular texture of the limb is somewhat albuminous, or nearly of gelatinous consistence, so that the swelling has a degree of elasticity. A somewhat similar condition of the effused fluid is seen in some cases of anasarcous effusion from more common causes.

The effusion of firm matter into the cellular membrane of new-born infants, which is occasionally seen, and even prevails epidemically at times, and has the name of Skinbound, has been likewise described as a kind of œdema; but appears to be rather a variety of erysipelatous or diffuse inflammation of the cellular membrane.

There are some cases of hæmorrhage on serous membranes, or in cellular texture, which appear to be rather perversion of the natural exhalation there, than the effect either of rupture of vessels or of inflammation ; but in most cases where such hæmorrhage without rupture takes place, it is attended either with some of the symptoms, and with some of the ordinary effusions, of inflammation,—or else with the indications of a general morbid state of the blood, to be presently mentioned.

CHAPTER XII.

OF DISEASED STATES OF THE BLOOD.

IT has been already stated, that in those Inflammations which were described as *specific*,—in those Febrile diseases which arise from peculiar poisons, and especially in those which are *contagious*,—and in those Organic diseases which are *constitutional*,—a diseased state of the blood, as to its vital, if not as to its physical or chemical qualities, pretty certainly exists ; and is essential to the production of these diseases, although not constituting their most obvious and distinctive character. In the present state of our knowledge, these states of the blood are hardly known to us otherwise than as the cause, or part of the cause, of the effects in question. In the different contagious febrile diseases the blood coagulates less firmly than usual; in Rheumatism it contracts more strongly, shews a stronger buffy coat, and apparently throws out more fibrine on an inflamed surface (such as the pericardium) than in other cases; in gout the exudations from inflamed vessels contain uric acid ; and in scrofula they often take the form of tubercles. In some of the constitutional organic diseases, such as the Fungus Hæmatodes, as well as in extensive suppurations, the morbid matter has been often found in the veins of the parts chiefly affected, and even in the heart. In cases of Amenorrhœa, and Chlorosis, and in a few

cases, where no cause for the symptoms is known, the very pale, sallow, greenish, or yellowish complexion evidently shews, that the blood has undergone a change of composition. But these facts are not sufficient to give us any precise information, either as to the cause or the exact nature, or extent of influence, of the change effected in the blood in these diseases. Besides these, there are a few cases, in which a diseased state of the blood not only evidently exists, but is more obviously concerned in producing the essential symptoms.

I. There are cases in which, from original malformation, of which there are many varieties *, the arterial and venous blood are mixed in various proportions at the heart; so that part of the blood, which is conveyed by the aorta, has not been at the lungs since its last circulation through the body. From this arises a bluish or livid colour of the skin and lips, varying in intensity in different cases,—easily increased by any exertion, and so distinct as to have procured for the affection the name of Morbus cœruleus or Cyanosis,—palpitation and dyspnœa, and even fits of insensibility, on attempting such exertions as hurry the movement of the blood,—coldness, or at least very easy chilling of the surface,—and generally imperfect nutrition, at least as to the breadth or thickness of the bones, muscles, &c. Death sometimes occurs suddenly, in fits of syncope or of convulsion; and the predisposition to various other diseases, as may be judged from what has been repeatedly stated, is so great, and the strength of vascular action so much impaired, that such persons hardly ever attain middle life.

It is remarkable, that in such cases, when the solids of the body have never felt the agency of perfect arterial blood, they can perform their functions, and the sensations and powers of the mind are entire, at a time when, judging from the colour of the surface of the body, we may presume that the blood is as impure as in the last stage of those diseases which are fatal by asphyxia.

* See HOPE on Diseases of the Heart, p. 465.

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II. The most striking example of a disease clearly referable to a morbid state of the blood, is the Scorbutus or Sea-scurvy, where, in consequence of the long-continued use of salted animal food, the blood becomes preternaturally fluid, ecchymoses, or purple or livid spots (petechiæ and vibices), form on the surface of the body, undergo the same changes of colour as effused blood there, and often pass into ulceration; the gums become swelled and spongy, hæmorrhages often take place from them, and occasionally from other parts; great debility and emaciation ensue, and, in particular, such activity of absorption, that ulcers recently healed generally break out, and even the callus uniting broken extremities of bones has, in some instances, disappeared; these symptoms either go on to death by inanition, or else they combine themselves with, and greatly augment the danger of, any other disease that may be contracted at the time; but they all speedily disappear when fresh vegetables are taken, and have been thought to yield particularly to the use of the vegetable acids.

It is important to observe here, that, while the main cause of these symptoms is certainly the use of salted provisions (which is much more effectual in producing them than the use of merely innutritious articles of diet), all observers agree that other causes, which cannot alter the ingesta, nor exert any other but a *vital* agency on the composition of the blood, particularly Cold, and Mental depression or inactivity, contribute powerfully to the production of the disease.

It is also important to observe, that, in this case, where the composition of the blood is undoubtedly in fault, as well as in others already considered, where morbid alterations of the blood are only presumed to exist, although the cause is general to the whole body, great part of the symptoms (hæmorrhages or ecchymoses and ulcerations), are strictly *local*, and take place particularly in the skin and in the mucous membranes.

III. Precisely similar symptoms are seen, in a few cases,

at all periods of life, in persons who have not lived on
salted food, sometimes in persons previously quite healthy,
often repeatedly recurring in the same individuals, and
from causes altogether unknown.   To these cases, the
names of Hæmorrhœa Petechialis, and of Purpura Hæmor-
rhagica have been given, of which the first expresses best
what is known of the disease ; for the tendency to effusion
of blood is by no means confined to the skin or subcuta-
neous cellular membrane, but has been observed to take
place, sometimes so suddenly and copiously as to be fatal,
in various internal parts ; on mucous membranes, on se-
rous membranes, even within the pericardium, and in the
brain.

Such cases of sudden and copious hæmorrhage are some-
times attended with febrile symptoms; and in many cases
of this disease, it is certain that symptoms of internal in-
flammation have accompanied the appearance of petechiæ,
and that the remedies for inflammation have been evidently
beneficial.   But the reason probably is, that many of the
cases of purpura are in fact complications of different inflam-
matory diseases with the peculiar state of the blood, which
leads to these symptoms; and which may perhaps have
existed previously, and not shewn itself until inflammation
and febrile action were excited; in like manner as petechiæ
shew themselves occasionally even in the early stages of
contagious fever and of smallpox; but generally in consti-
tutions previously weakly, and in which the blood may be
supposed to have previously undergone a certain degree at
least of morbid change.   In many cases of this disease,
blood taken from the arm has appeared preternaturally
fluid; but it must be observed, that in some, at least of the
more complex cases, the blood has coagulated firmly, and
shewn the buffy coat, within a very short time after some
of these passive hæmorrhages have taken place.

IV. Another case of disease, which may be confidently
ascribed to a morbid state of the blood, is the disease of the
extremities, characterized by spasms of the limbs, and by

inflammation going on rapidly to gangrene, and that of the kind called Dry Gangrene, (in which the fluids appear to be somehow diverted from the diseased parts), which has been frequently observed to be endemic in certain districts; and has been ascertained, by many observations, and by experiments on animals, to be the effect of the use of rye, infested with the parasitical plant called Ergot. That the blood must be much altered in this disease is sufficiently obvious; but the particular character of the alteration effected has not been ascertained.

It is highly probable that the blood must undergo some change in various other cases, where local diseases are gradually excited by ingesta taken for a long time together; such as the emaciation and tremors produced in some persons by mercury; and especially the Colica Pictonum, *i. e.* obstinate constipation, with frequent vomiting and severe pain of abdomen, ultimately often attended with wasting and palsy of various voluntary muscles,—which is produced in many persons by lead, habitually introduced in small quantities for a long time, in whatever way, into the system. The inquiries of ANDRAL have established the fact, that no change of texture in the stomach or bowels necessarily or even frequently attends this disease; but the nutrition of the muscles in the paralytic cases, is both much diminished and changed by the action of the lead. Still, however, it may be doubted whether the lead affects the sensations and functions of one part, and the nutrition of another, by first changing the blood, or whether it is merely carried by the blood to these different organs, and there acts on them, after a time, as a poison.

As the chemical department of Physiology and Pathology advances, and especially as the laws peculiar to Vital Affinities are developed, we may hope that important discoveries will be made in regard to the essential nature of the changes that take place in the living body, in the diseases which have been mentioned in this chapter.

CHAPTER XIII.

OF DISEASED STATES OF THE NERVOUS SYSTEM.

THE share which the Nervous System appears to have in producing or altering disease in other parts of the living body, has been repeatedly under consideration. We are here to treat of the pathology of those cases only, in which the functions of Sensation, Thought, and Voluntary Motion are themselves altered or perverted.

Of these cases, the greater number, and in a practical view the most important, have likewise been already considered; viz. those cases, in which the affection of the Nervous System, although often an obvious, or even the most important part of the symptoms, is manifestly consequent on other changes, by which the diseased state is more essentially characterized. We have stated in what manner the functions of the Nervous System are frequently affected by mechanical injury, by heat, cold, electricity, &c. by poisons, and by the influence of imperfectly arterialized blood in asphyxia; again, how they are often altered, either by sudden diminution, or sudden increase of the flow of blood to the brain; by hæmorrhagic effusion there; by inflammation and its consequences; by the different forms of idiopathic and eruptive fevers, and by the kind of inflammatory action which frequently accompanies these; how they are affected sympathetically, in cases of disordered secretions, especially of the primæ viæ; and more uniformly in cases of suppression of excretions, especially of that at the kidneys; and how they are variously altered in cases of organic disease affecting the brain itself, or its envelopes, or by serous effusion within the cranium. And we have found that in all these cases the affection of the Nervous System may proceed to absolute Coma, and to death from that cause.

Now, there are cases, some of them frequent and important, in which changes in the functions of Sense, Thought, and Voluntary Motion,—similar to those which have been enumerated as proceeding from these different causes,—take place independently of the application of any of these; or where these have been applied in a degree so very much less than that which is often unattended with any such effect, that the action of some additional cause is clearly manifested. These necessarily imply corresponding changes in the Nervous System, which is the physical agent concerned in all these functions; but as all changes, healthy and morbid, which take place in the nervous matter, corresponding to mental acts, are known to us only by their effects, it is impossible for us to do more, in regard to the morbid changes thus *originating* in the Nervous System, than state the symptoms by which they are made known, the circumstances in which they are observed, and the effects which result from them.

Two general observations, however, may be premised on these strictly nervous affections, and their connexion with the state of the vascular system. 1. That as the healthy action of any part of the Nervous System, when strongly excited, appears to be attended with some increase in the flow of blood to that part, and as the total inactivity of any part usually leads to a diminished supply and consequent wasting,—so it is reasonable to suppose, that a morbid increase of the activity of the changes in any portion of nervous matter, although not originating in, may readily *become attended by*, an increased determination of blood thither; and although we cannot affirm that this is a general law, yet many facts in the history of diseases indicate that it is a frequent and important occurrence. 2. That the state of the Nervous System most favourable to the *original excitement* of such nervous disorders, is generally that which attends great weakness, and in which both the fulness of the vessels, and the strength

of vascular action, must be supposed to be below the average *.

I. We have various instances of Sensations undergoing much change, both in kind and intensity, for which we can assign no reason, either in the application of any known external agent to the Nervous System, or in any altered action of the vascular system. There are cases, not only of original defect of sensibility in the eye or ear, general or partial, *i. e.* either congenital amaurosis or deafness, or insensibility to certain colours or sounds, without any unnatural appearance either in the exterior parts, or in the nerves of these organs; but there are cases likewise of such affections coming on in the progress of life, without apparent cause, without benefit from remedies applied, either to the state of the circulation in the head, or to the condition of any part by which the organs of sense may be thought to be sympathetically affected, and without change of structure of the parts, or with such change only as may be regarded as the effect, not the cause of their disease.

The Anæsthesia or loss of common sensation in more or less of the surface of the body, although often manifestly the result of injury of some part of the Nervous System, and coexisting with other symptoms of palsy, occurs in some instances without such accompaniments, and when no cause whatever appears for it on dissection. Much more frequently we meet with cases of pain, referred distinctly to individual parts of the body, often very intense and very lasting, which the whole history of the cases shews to be strictly *nervous*; *i. e.* to be an alteration of the function of

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* " Lorsqu' un individu a perdu dans un court espace du temps une très grande quantité du sang; lorsque convalescent d'une maladie longue, il a été pendant très long-temps privé de toute espece de nourriture; lorsqu' à la suite d' une inflammation aiguë il reste en proie à une phlegmasie chronique, lorsqu' en un mot, il a beaucoup perdu sans reparer, il arrive souvent que l'impressionnabilité des centres nerveux devient d' autant plus grande que la quantité du sang diminue, et que le systeme musculaire s'affaiblit. Dans cet état, l'hyperemie la plus legerement douloureuse peut determiner dans le systeme nerveux les desordres functionnels les plus graves."—ANDRAL., Precis, &c. t. i. p. 18.

the nerves of the part, for which no adequate cause exists, either in any diseased structure, or in any diseased action of vessels.

Such pains have the general name of Neuralgia, and the following appear the most important facts regarding them.

1. They occur (chiefly in adults, and in persons whose health is otherwise disordered) in all parts of the body, but most frequently in the head and abdomen. Many head-aches, and especially those which affect one side of the head, and recur at pretty regular intervals, and have the name of Hemicrania, are of this description; so also is the severe pain of face termed Tic Douloureux. Some cases of Angina Pectoris appear from their history to have no more permanent origin. Many cases of Gastrodynia, and of pains, even fixed and violent, referred to different parts either of the abdomen or sides, or to the situation of the uterus and back, appear to be of this description; and some cases of severe pain of the hip-joint, of the feet, or other parts of the lower limbs, are more correctly referred to this head than to Rheumatism.

2. They have been stated to follow evidently the course of certain nerves; but this is neither uniform, nor charac-teristic, as distinguishing them from other diseases of nerves themselves. But they are chiefly characterized by the sud-denness of their attack (which is repeated often at pretty regular intervals), and frequently of their abatement also; by the total absence of heat, and swelling, and often of ten-derness when they are external, and of febrile symptoms when they are internal, even although their intensity be extreme; by frequently appearing to be determined by sud-den changes of weather; by occurring chiefly in persons of nervous temperament, and in connexion frequently with other nervous affections; and by abating frequently under the use of remedies called Tonic (perhaps more properly specifics), rather than under antiphlogistic treatment.

3. These pains, although hardly ever observed during violent inflammatory diseases, are by no means incompa-tible, but on the contrary frequently combined, with such

inflammation as is subacute, or tends but little to disorganization, in the parts where they occur. Even in that case, however, they retain their character in some degree, and are benefited only partially by the antiphlogistic, and often chiefly by the more specific remedies subsequently used.

Besides the nervous pains, there are certain cases of other uneasy sensations, such as Vertigo, or morbid sensations of Heat, or of Cold, the pathology of which appears to be the same. And the rare and singular cases of that modification of morbid sensation formerly mentioned, as spectral appearances *, are equally unconnected, either with inflammation, or even decided congestion of blood, or organic disease.

II. There is a large class of Spasmodic Affections, which would appear to originate in morbid action of the motor nerves, and of the parts within the spinal canal and cranium immediately connected with them ; certainly without either inflammation or organic lesion of these parts, and without distinct evidence even of vascular congestion there, as an essential condition, although it may often be an aggravation, of their existence. These spasmodic diseases may in general be distinguished from those which depend either on the effects of inflammation, or on organic disease, by their being unattended with insensibility; and indeed, in several of these, the spasms may be said to denote rather a *perversion* of Voluntary Motion than strictly Involuntary Motion.

Although there are many cases of Epilepsy (*i. e.* of habitually recurring fits of convulsion with insensibility) in which no organic lesion is perceptible on dissection, yet the frequency of organic disease, in cases of epilepsy, the singular obstinacy of the disease, its manifest aggravation by such causes as forcibly impel the blood towards the head, and its gradual injurious effect on the mental powers, render it highly probable that in every case of that kind some orga-

* See Physiology, p. 209.

nic alteration exists, although it may be confined to structure too minute to be detected.

Of the other Spasmodic Diseases there are three divisions, obviously distinguished from one another, in one of which the affection of the voluntary muscles is general and irregular, and seldom dangerous; in the second it is equally general, but much more uniform and violent, and attended with very great danger; in the last it is confined to certain of the muscles concerned in respiration, and is uniform in its character, and always attended with inflammation, of greater or less violence, in the mucous membrane of the air-passages.

The *first* of these divisions comprises a number of cases, in which the spasms vary so much, that it is impossible to rank them together under one general description; but the most definite cases of the kind are the following.

a. The involuntary motions of one side of the body, increased by attempting any definite movement, and attended by much weakness of the lower extremity of that side, which are known by the name of Chorea, which occur chiefly between the ages of ten and fourteen, and often abate entirely, under various treatment, within a few months; in some instances, however, going on, either to permanent amentia, or to fatal hydrocephalus.

b. The fits of Convulsion, affecting many parts of the body, but commencing generally with uneasy feelings in the abdomen, and with the sensation called Globus ascending thence to the throat, and exciting a spasm of the glottis,—called Hysteria, differing from epilepsy in being unattended with insensibility; in the paroxysms being more generally excited by some evident cause, and recurring often more frequently within a short time, but much less pertinaciously throughout the life of the patient:—a disease hardly ever seen in the male sex, and admitting of very great variety as to the nature of the spasms, the frequency of their recurrence, the other affections of the nervous system, and of the secretions of the body attending it, and also as

to concomitant affections of the vascular system, the pulse being full and firm, and evacuations of blood useful in some cases, while in others there is great weakness and advan- tage from stimulants.

The variety as to the symptoms and history of the dis- ease is in fact such, that there is hardly any other disease, the symptoms of which may not be imitated, more or less exactly, in persons liable to hysteria, by affections which are simply nervous, and which are evidently akin to hyste- ria, and are generally designated by that name. Thus vio- lent fits of coughing, or of vomiting, dependent on peculiar sensations, which seem to reside in the nervous system only, without any indication of disease of the bronchiæ, lungs or stomach, are not uncommon in persons liable to hysteria. Fits of convulsion in children, without insensibility, as from teething, or from worms, or disordered bowels, are often more analogous to hysteria than to epilepsy, particularly as to their ultimate results.

c. The rare, but well marked, and easily distinguished, state of the voluntary muscles called Catalepsy, in which the limbs retain any position in which they are placed ; a state never of long continuance, often combined with hys- teria, but which, as it evidently implies a perversion of the mental act of volition, is generally excited by mental causes, and attended with more or less aberration of intellect.

Some general observations, of practical importance, may be made on the whole of the cases of disorder of the func- tions of the organs of sense and voluntary motion hither- to noticed, and which are often the source of great uneasi- ness, but unless they become complicated with others, seldom dangerous.

1. They are in many instances almost precisely similar to the alterations of these functions which may result, either from chronic inflammation and its effects, or from organic disease affecting the portions of the nervous system concern- ed in them. For example, the amaurosis, for which no cause may appear on dissection, is often not to be distin-

gnished from that which may turn out to have been con-
nected with the growth of serous cysts, or hydatids in the
choroid plexus, or chronic softening of the optic nerves, or
adjoining portions of brain, or effusions of serum into the
ventricles.   And a simple neuralgia is often not to be dis-
tinguished (except perhaps by its more frequently changing
its seat) from those pains which may result, either from
chronic softening at the base of the brain, or in a portion
of the spinal cord, or from pressure, in one way or other
applied to the affected nerves in their course.

2. This analogy gives us reason to suspect, that even
when no organic lesion appears on dissection, such disor-
ders may often proceed from imperceptible changes in the
organization of the portions of nervous matter concerned.
And accordingly we find, that these simply nervous disor-
ders are most common in the same description of persons,
and under the same external circumstances, as organic dis-
eases * ; they are more common in the inhabitants of towns
than of the country, more common in those whose lives are
sedentary than in those who have much habitual exercise
in the open air; several of them are more common in scro-
fulous than in sound constitutions, and probably all in the
children of sickly than of healthy and robust parents.

3. When we have reason to think, particularly from the
ultimate result of the cases, that these disorders have real-
ly no permanent cause in the *structure* of any part of the
nervous system, we may observe that they occur only in
certain individuals, and that in them there is a certain pe-
culiarity of the actions of the nervous system, for which
we have no more precise or definite expression than Ner-
vous Irritability, or Mobility ;—a state which is more com-
mon in women and children than in men, and in all persons
when in a state of weakness, than when in the full enjoy-
ment of muscular strength ; in women, particularly, more
common about the menstrual periods, and immediately after
delivery, than at other times ; more common likewise in
those in whom the menstrual flux is habitually excessive,

* See p. 251.

or altered as in Leucorrhœa, or suddenly suppressed, or
more gradually obstructed in the different forms of Amenor-
rhœa, than in others;—in which both sensations and emo-
tions are intensely felt, and their agency on the body is
stronger and more lasting than usual; and in which con-
tinued voluntary efforts of mind, and steady or sustained
exertions of the voluntary muscles are difficult or impossible,
the muscular motions usually rapid and irregular, and the
" animus, nec sponte, varius et mutabilis." When such a
general condition of the functions of the nervous system
exists, any portion of it, on which a special cause may act,
is apt to fall into a diseased mode of action more or less re-
sembling that which inflammation or organic disease may
excite in it. And it is farther of great importance to ob-
serve, that this tendency is greatly increased by each repe-
tition of diseased action of this kind; or even by any im-
pression made by sensations or emotions on the bodily or-
gans, so strong as to indicate the existence of this mobility
of the nervous system; and therefore, that avoiding all oc-
casions of exciting violent sensations or emotions, is of es-
sential use in correcting the tendency to such diseases.
One modification of this nervous temperament, very fre-
quently connected with its other marks, is the disposition
of the mind to dwell upon all uneasy sensations, and antici-
pate danger from them, which so frequently attends all dis-
eases of which permanent uneasy sensations are an essen-
tial constituent, and especially disorders of the stomach and
bowels, and to which we give the name of Hypochondriasis;
—which is chiefly observed in persons of the melancholic
temperament, but not confined to them, and is more pro-
perly described as a condition of certain functions of the
nervous system which accompanies and aggravates many
chronic diseases, than as a disease *sui generis*.

4. The nervous disorders in question, are easily excited
sympathetically by diseases of other parts of the system;—
not so much, however, by violent febrile or inflammatory
diseases, in which the circulation of the blood is much ex-
cited, as by those in which the secretions are much derang-

ed, and many uneasy sensations produced, without excite-
ment of the circulation. Hence the symptoms of these dis-
orders are very frequently combined with Dyspepsia in all
its forms, with Constipation, Diarrhœa, and derangements
of the Menstrual flux.

5. These nervous pains, or other uneasy feelings, and
slighter spasms, are the description of diseases most easily
excited by mental emotion, especially in constitutions of
the peculiar nervous irritability already described. Such
affections, accordingly, in varied and sometimes in un-
usual forms, have very often been excited by intense re-
ligious enthusiasm, and often by the emotions excited
by such applications as the metallic tractors (real or fic-
titious), or the manipulations of those who profess ani-
mal magnetism.   In all such cases, agreeably to what
was formerly stated *, the emotions that may be excited
are much heightened by the presence and participation of
numbers; and these are the diseases which have been par-
ticularly observed to spread by Imitation, nearly after the
manner of epidemics.

The *second* order of Spasmodic Affections, which seem
to originate in morbid action of the nervous system itself,
comprises the very dangerous disease called Tetanus, and
the almost inevitably fatal one called Hydrophobia.   The
first, in a few cases, originates idiopathically from cold,
but is much more generally excited by injuries, in which a
portion of nerve has no doubt peculiarly suffered, although
its injury is often imperceptible on examination.   The dis-
ease does not commence, however, till some days after the
cause has been applied; and of the nature of the changes
taking place in the interval we have no information what-
ever.   It is characterized by violent painful tonic spasms,
with frequent aggravations, but no absolute relaxation,
beginning in the muscles of the hind neck and lower jaw,
and extending over the whole muscles of the body; it is
unattended with any affection of the functions of the brain

* See Physiology, p. 273.

proper; and is fatal, not by coma, but merely by reason of the gradual failure of the strength of the circulation, which accompanies the repeated paroxysms of spasm, nearly as it accompanies violent spasms of the same description when produced in animals by the action of poisons, or by extensive injury of the spinal cord.

Hydrophobia is likewise produced by the action of the specific cause, and an interval, varying from a few days to several months, likewise elapses between the time of its application and the commencement of the disease; but in this case the cause is a peculiar animal poison, the conditions necessary to the generation of which are not yet ascertained, communicated only by inoculation, and which seems, like the poisons exciting the contagious exanthemata, to multiply itself in the blood during the latent period. The spasms are here first and chiefly in the muscles of the fauces, and are repeatedly excited or aggravated by external causes, by the contact of any fluid with the fauces, or even of cold air with the face; but they generally extend over the body as the disease advances, and death takes place, as in Tetanus, not in the way of coma, but rather by syncope; in consequence of the gradual depression of the heart's action that attends the violent spasms, perhaps in consequence partly of a sedative action of the contagious poison on the heart itself.

Although a congestion of blood on the surface of the spinal cord has been described by some in cases of Tetanus, and although an unusual vascularity in the mucous membrane of the pharynx and œsophagus is common after Hydrophobia, yet these appearances are certainly to no great extent; it is probable that they may be rather effects than causes of the morbid actions; and at all events, they do not afford, by comparison with other cases of inflammation of these parts, any explanation of the peculiar phenomena of these diseases, nor invalidate the conclusion, that they are both to be regarded as strictly diseases of the nervous system.

The *third* head of Spasmodic Affections of this class consists of the two well known spasmodic diseases of the respiratory organs, Hooping Cough and Asthma.

The first of these unites the singular properties of being the effect of a specific contagion, and equally incapable of alteration, as to its duration or essential symptoms, by remedies, as the contagious exanthemata themselves,—of being unattended with any typhoid tendency,—and of being characterized by a combination of the symptoms of bronchitis with a peculiar spasm, chiefly of the muscles of the glottis, which takes place only during the fits of coughing, and narrows the opening there, so as to cause the peculiar crowing sound in inspiration ; and which continues long after the febrile symptoms of the first stage of the disease have subsided, and the bronchitis assumed the chronic form.

The danger in this disease is partly from the extension of the bronchitis to all parts of the lungs (when it always becomes dangerous), and from its consequences in the lungs; viz. emphysema in most severe cases,—peripneumony in a few,—and phthisis in many ; and partly from the effect of the congestion of blood in the brain during the long continued fits of coughing, in exciting fits of convulsion with insensibility, and sometimes hydrocephalus.

In regard to Asthma (*i. e.* Dyspnœa occurring in paroxysms, with a wheezing sound of respiration, and going off, after some hours, with mucous expectoration, believed to depend on spasmodic constriction of the bronchial tubes), the following facts seem most worthy of attention.

1. Its attacks commence very generally, like epilepsy and gout, after the first sleep, *i. e.* at the time when the blood is perhaps in fullest quantity, its movement slow, and its congestion in internal parts easiest, because it is least solicited to the surface of the body, or to the organs of sense or locomotion.

2. It seems to be always attended with more or less of bronchitis, but this exceedingly various in degree, and also in kind ; being slight in the cases that are most purely spas-

modic (or dry asthma) ; acute, and demanding early and active remedies in some cases that are attended with fever, and where there is but little remission of the dyspnœa ; and again quite chronic in other cases, chiefly of older standing, where there is much abatement without disappearance of the cough and dyspnœa, copious expectoration, and little or no fever, and little variation of the symptoms for weeks or months, (humid asthma).

3. The spasmodic nature of the disease appears to be indicated by its distinctly hereditary character, by the exciting causes of many of the paroxysms, by the evident constriction of the bronchiæ during the paroxysm, and the frequently complete and rapid abatement of that state, and by the experience of juvantia and lædentia in many cases of it ; and, like other spasmodic diseases, it evidently facilitates its own return. But there are many cases in which the spasmodic paroxysms are neither frequent nor violent, and the chronic bronchitis is the more urgent disease.

4. Although a degree of Bronchitis probably always attends asthma, this is by no means the only pectoral disease on which asthma will supervene. In those who have the tendency to them, asthmatic paroxysms supervene on any cause of permanent impediment to respiration ; e. g. on disease of the heart, on phthisis, and on the sequelæ of pneumonic inflammation.

In regard both to Pertussis and Asthma, it is to be remembered, that as the lungs are forcibly compressed during the violent fits of coughing, at the same time that the opening for the exit of the air is narrowed, these diseases furnish the most favourable conditions for the production of Emphysema of the lungs, which accordingly very generally supervenes on both, and is a cause for permanent dyspnœa when either has been violent and of long duration. It has been already stated, that after pertussis this state of the lungs may certainly spontaneously abate; but in asthmatic cases, when the disease becomes habitual, it is probably much more permanent after being once established. After a time it is very generally followed (as already stated) by in-

duration of the liver, and often by ascites; and therefore asthma (although often recurring occasionally for a great length of time, without seriously injuring the constitution), if it recurs very frequently, becomes at length more dangerous than simple chronic bronchitis.

There are some cases, in young children especially, of spasmodic affection of the muscles of the glottis, producing a sound exactly resembling that of hooping cough, recurring occasionally, chiefly after sleep, without cough or indications of inflammation; and which appears to be just on the same footing as other spasmodic or convulsive affections in young children, depending often on local irritations acting on the body, and connected with, or increased by, determination of blood to the brain.

Again, there are many cases, at all times of life, where the symptoms of laryngitis, or cynanche trachealis, are combined with, and aggravated by, spasm at the glottis (as those of acute bronchitis are with spasm of the bronchiæ in violent cases of asthma); are subject to remissions, after the manner of spasm, and are benefited by the remedies for spasm, used in combination with those for inflammation.

III. The next class of diseases of the Nervous System is that of Vesaniæ, or alterations of the mental powers or faculties; which we can have no doubt depend on alteration of the state of the nervous matter in the brain; because we know that it furnishes the physical conditions necessary to the manifestation of all mental phenomena.

The diseased states to which the mental powers are liable, are most easily understood as consisting in, or depending on, alterations of the laws according to which the different thoughts succeed each other in the mind, and of the intensity and duration of the attention fixed on them, rather than of the nature of the mental acts themselves *.

The great and obvious division of these diseased states is into the state of Amentia or Fatuity, and that of Dementia or

* See Physiology, p. 212 and 225.

Insanity, both of which states admit of very considerable varieties.

Both states are very frequently produced temporarily by inflammation, and by different febrile diseases, and more permanently by organic diseases, in which the brain is affected; and both may be suspected to proceed in every case, from some alteration of the structure of the parts of the nervous system, with which the mind is specially connected; but this alteration is certainly in many cases imperceptible by any means yet known for detecting such changes; and some of the forms of both kinds of mental disease commence so suddenly, and abate so completely, that it is difficult to suppose any peculiarity of structure that may exist to be essential to their existence, or to be on any other footing than a great predisponent cause of them.

The state of Amentia is that in which impressions on the senses, although distinctly felt, and exciting certain mental acts, fail to suggest many of those thoughts which in men of sound minds would naturally, and according to the ordinary laws of association of thoughts, result from them. This obviously admits of a subdivision, according as the deficiency lies in the simple suggestion of objects of sense, or of thoughts previously before the mind in connection with each other,—or as it lies in the suggestion of the relations of things (which are perceived by what was described as the faculty of Abstraction), and of the abstract notions which were described, as either naturally attending different acts of mind, or formed by our perception of the relations of things,—and which are the subjects of Judgment and Reasoning. In the first case, there is merely loss of Memory; in the second there is Idiocy; and both admit of many varieties; for in many persons some of the associations by which thoughts are laid together in the mind are retained, while others are lost; and again, in many persons, some of the relations of things are distinctly perceived and remembered, while others are wholly overlooked.

The state of permanent idiocy is probably always the effect of original malformation (often obvious on inspection

of the skull) or injury or alteration by disease of some part of the brain; and when it takes place in the course of life (as, *e. g.* after long-continued chorea, or many fits of epilepsy) is seldom removed, and very often a prelude to ultimate coma.   The loss of memory, though very often dependent on organic lesion, is often observed in old age, in persons convalescent from febrile diseases, &c. without visible change of structure; and there are some cases (chiefly of the anomalous and slighter affections of the nervous system) where it occurs, even repeatedly, and disappears so suddenly and so completely, that we cannot suppose it to have been connected with disease of structure.

The state of Somnambulism or Reverie, formerly mentioned (p. 280.) although one in which the mind often acts with great energy on certain objects of thought, is yet properly ranked under the head of Amentia, because some of the natural associations of thoughts are suspended, and the conduct of the person affected thereby altered, (sometimes without any hallucination or delusion being perceptible); and when this internal state of the mind ceases, little or no recollection is retained of what passed during it.   Short paroxysms of such a state are not uncommon, and have often been unconnected with any very serious disease in persons of the nervous temperament, chiefly in women subject to the slighter nervous diseases; and sometimes recur repeatedly, the recollection of what happened during each being recovered in the next paroxysm.   And in some cases this perverted condition of the mental powers has lasted so long, that knowledge previously obtained, or arts previously learnt, have been acquired again, during the suspension of the associating principles which ought to have suggested them; and then the lost association has been suddenly restored, and the mind regained possession of all that had formerly been learnt *.

The state of Dementia or Insanity is perhaps most uniformly characterized merely by the unusual energy or fervour with which different acts of thought are performed,

* See ABERCROMBIE on the Intellectual Powers, 3d edition, p. 303.

especially acts of Conception and of Imagination, and Emotions resulting from these.   When such acts take place with morbid energy, and the attention is involuntarily fixed on them with unnatural force, so as to exclude all other thoughts, which in the circumstances of the case would otherwise present themselves, and prompt to sudden, capricious, and absurd actions, Insanity may be sufficiently characterized, (as, *e. g.* in some cases of Projecting or Scheming Insanity), although no distinct hallucination or delusion can be detected.   But in by far the greater number of cases, the morbid vividness of the conceptions or fancies, in the mind of the madman, overpowering the checks, which, in the natural and healthy state, prevent our believing in the real and independent existence of the images formed in our minds *, he reposes belief in something which he has conceived or imagined, in like manner as all men do in the images presented during sleep ; and this erroneous belief, or hallucination, " qua rerum relationes *falsæ* percipiuntur," shews itself in his language or actions, and indicates and characterizes his insanity.

This morbid state of great part of the train of thought in the mind, obviously admits of very considerable variety, without deviation from these essential characteristics.

In some cases, all or almost all the images formed in the mind are equally the subjects of this erroneous belief; so that the patient, although his mind will generally act for a short time in the natural way on any new object presented to his senses, and arresting his attention, yet, as often as he returns to those trains of thought, of which conception and imagination form a large part, relapses into the varied hallucinations that spring from the faith erroneously reposed in the images which these faculties present to him.   This is the state of the mind in what is properly called *Delirium*, so common in febrile diseases, and occurring occasionally in the course of many cases of more permanent insanity.

In other cases, it is only in regard to certain objects of thought that the mind acts with morbid fervour, and there-

* See Physiology, p. 219.

fore forms false judgments; and in regard to others, its operations are nearly natural. This is generally the case when there is no febrile action in the system, and the term Mania is then more correctly applied. In some such cases, the subjects of false judgment are very limited and unvaried for a great length of time; and such cases (called Melancholia by CULLEN), are now usually termed Mono-mania.

Again, there are many cases of mental derangement, where the whole train of thought is much more rapid than natural; and some where it is so rapid that the control of the will over it (see p. 229), is evidently suspended; and the language of the patient so rambling and incoherent as to convey no definite meaning. This is the state to which PINEL, and other French authors, restrict the word De-mence. When there is such rapidity of thought, the emotions attending the insanity are generally of the exciting class, either joy or anger.

On the other hand, there are many cases in which the train of thought is much slower than natural, or the succession of acts of thought almost suspended, the mind dwelling almost exclusively on particular images. In such cases, these images are usually attended by painful or depressing emotions, and the term Melancholy is that generally applied.

In many cases, along with, and generally consequent on, the delusions and emotions attending them, there is, at least occasionally, a propensity to violent and outrageous acts; and, in some of them, this propensity shews itself so suddenly, and with so little apparent cause in the previous language or conduct of the maniac, as to have led to the supposition that it is the sole disorder of the mind; but it does not appear reasonable or safe to hold such a propensity to be a sufficient indication of insanity, unless it be shewn to coexist with some mental delusion.

Again, there is a distinction, easily observed in many cases, and of considerable importance, between those forms of insanity, where the delusions rest on erroneous *conceptions*

of what has actually been before the senses, and those where they rest on morbid acts of *imagination* only, whereby persons or things are invested with fancied qualities, which are not supposed to have been actually under the observation of the maniac, but of the existence of which he nevertheless entertains a thorough conviction. This distinction is expressed by Dr ARNOLD by the terms Ideal and Notional Insanity*. The delusions in a case of delirium tremens from drinking, which are generally founded on morbid sensations, and on the recollections of these, are an example of the first kind; and the common hallucination of a combination or conspiracy formed to injure the affected person (who generally supposes, in such cases, not that he has seen or heard proofs of what he alleges, but that he has divined the thoughts of his enemies), is of the last kind, which is probably the more inveterate malady of the two.

The following facts are well ascertained by experience, in regard to the circumstances in which the diseased actions of the nervous system, on which these lesions of the mental faculties depend (but which are known to us only by their effects), are chiefly observed.

1. Abstracting from the case of the delirium of fever, there is only a small portion of the human race who are susceptible of this kind of disease.

2. In a very large proportion, probably a majority, of those who are affected in these ways, a predisposition from hereditary constitution may be traced.

3. In a large proportion also, some of the organic diseases within the cranium, formerly mentioned, (p. 284), are found on dissection, with or without serous effusion, and frequently there are marks either there or in other parts of the body, of scrofulous disease. Where there has been no organic disease, something unusual in the form or texture of the bones of the head has often been remarked.

4. In those thus predisposed, the disease shews itself more frequently between the ages of twenty-five and forty,

* Observations on Insanity, vol. i. p. 72.

than any other time of life; and the earlier it does so, there is the more chance of at least temporary recovery.

5. In those predisposed, mania may be excited by almost any cause adequate to excite any kind of disease; probably the most frequent exciting causes are, intemperance in the use of strong liquor, or in venereal indulgences, the irritation of mercury, long continued external heat, injuries on the head, the suppression of usual evacuations, and mental emotion. The symptoms attending a violent fit of mania, excited by any of these, as well as the nature of the causes, the other diseases with which it may be combined, the juvantia and lædentia, and the effusions in the brain frequently found after such a fit has been fatal, clearly indicate that an increased determination of blood, and frequently even an inflammatory action, has preceded and accompanied the attack; but in every such case, a peculiar predisposition must have existed to give this character to the effect of such morbid vascular action; and in many of the cases, where the predisposition is strong, little or no excitement by any of those external circumstances can be perceived.

The cases of insanity which present the best prospect of a perfect recovery of the mental powers, are those in which the action of a powerful exciting cause is the most manifest, and previous disposition least obvious; but these are also the cases which bear the closest analogy to inflammation, and in which there is perhaps the greatest risk of the maniacal excitement, if not moderated by remedies, quickly subsiding into fatal coma. Such are many of the cases of insanity immediately succeeding delivery.

The Delirium Tremens from drinking (but which almost invariably commences after the excitement from the strong liquor is over) may be said to differ from other cases of insanity, in shewing throughout its course the action on the brain of a substance which affects the constitutions of the patients, on the footing of a poison, but not of a narcotic poison. The mental hallucinations are founded in a great measure on what may strictly be called spectral illusions, and are attended uniformly with tremors resembling but

exceeding those of typhoid fever. The effect of this poison to produce this form of disease is manifestly determined by previous predisposition, the effect being seen only in a very small proportion of those to whom the cause is applied. And the specific action of the poison on the brain and nerves appears manifestly to be aggravated and maintained, sometimes by a morbidly diminished, and at other times by an increased, action of vessels,—as indicated both by the symptoms accompanying the mental derangement, and also by the juvantia and lædentia ;—the specific effect of opium, in controlling the characteristic symptoms of the disease being sometimes certainly aided by antiphlogistic, and at other times by stimulant remedies.

The peculiar agency of a cause affecting the nervous system in this disease after the manner of a poison, is shewn by the mode of fatal termination of the disease, which is hardly ever preceded by coma, but takes place almost instantaneously, or in the way of syncope.
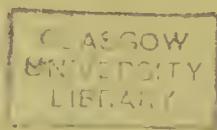
In almost all other cases of Mania, the immediate danger of death, in so far as it is connected with the mental disease, may be said to depend on the gradual accession of coma; and the fatal result is accordingly very generally preceded by a combination of other of the cerebral diseases, Epilepsy, Phrenitis or Hydrocephalus, &c. and very often Fatuity;—which combinations may probably be owing sometimes to extension of organic disease in the brain, and sometimes to accession of more acute disease there.

The remarkably partial affection of the mental powers, in many cases of Mania and Melancholia, and the limitation of the morbid condition of the mind, in many cases, to its exercise on particular objects of thought, may be thought to favour the supposition of the appropriation of individual parts of the brain, either to particular acts of mind, or to acts of the mind on particular subjects; but it does not appear on examination of this subject, either that the allocation of the different operations of the mind, in the different parts of the brain, proposed by GALL and SPURZHEIM and their followers, is confirmed by observation of the
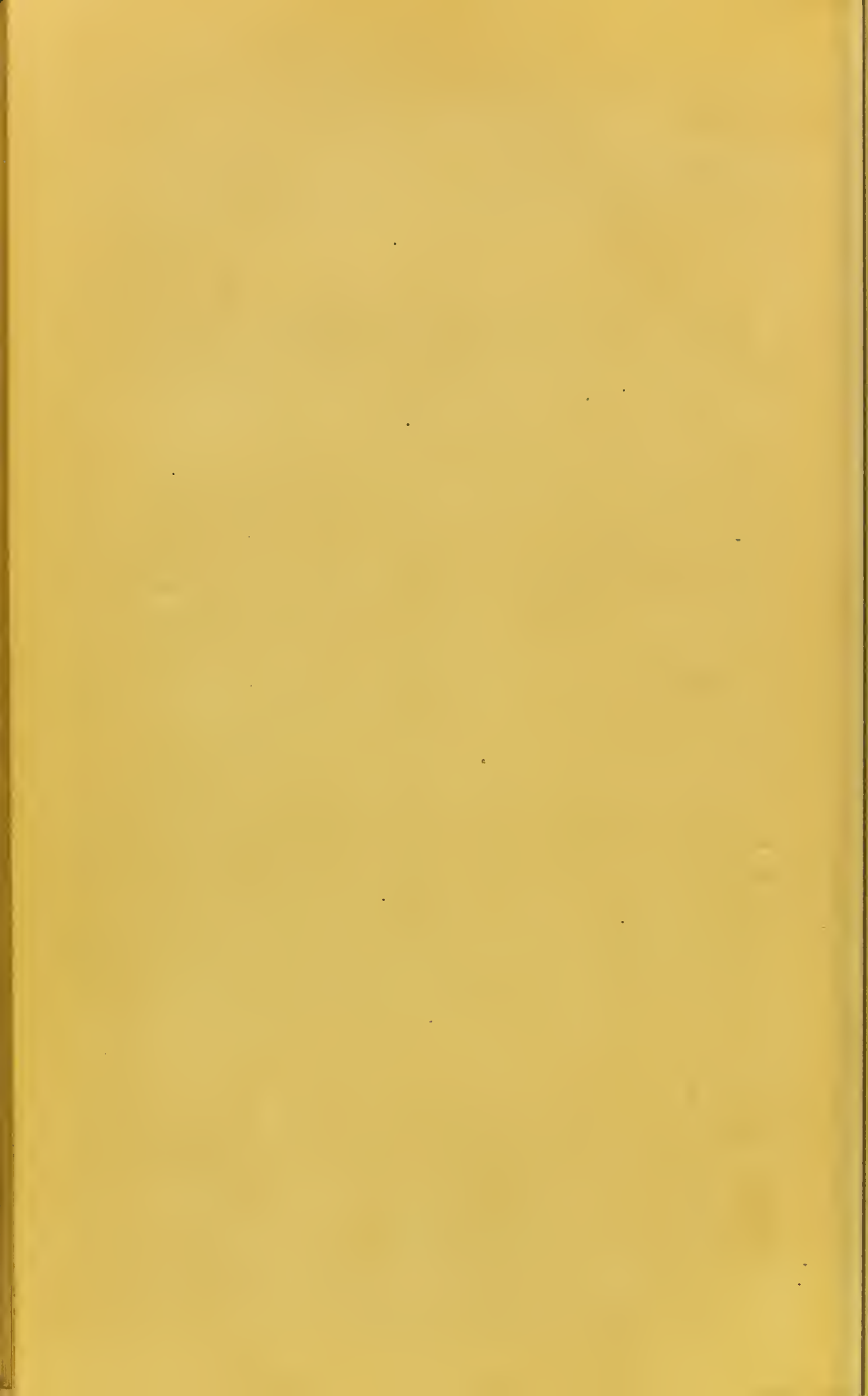
portions found to be diseased in these cases of partial insanity; or that the forms of the partial insanity itself correspond to their divisions and arrangement of the mental acts.

IV. It is important to state in regard to the complete suspension of the functions of the Nervous System in Coma, that while that state is clearly the effect, and often the final effect, of various external agents applied to the brain, —of concussion,—of mechanical compression,—of narcotic poisons,—of venous blood,—of congestion of blood in a few cases, and inflammation and its consequences in many,—of animal poisons,—and of various kinds of disorganization in the nervous matter itself,—there are also cases, chiefly in persons of the habit described under the name of peculiar mobility of the Nervous System, in whom absolute coma may be the effect of a change of action there, apparently without change of structure, and certainly without perceptible application of any of those causes. Of this the most striking examples are in the cases on record of long continued stupor, occurring chiefly in women, and in the circumstances stated above, (p. 310) which have been described as Hysteric Coma; and from which there may be speedy and perfect recovery. This is important as an unequivocal example of great alteration of those imperceptible changes in the Nervous System, which attend the different acts of Sensation, Thought, and Voluntary Motion,— without any such alteration of its texture, as is incompatible with the speedy restoration of all its vital powers.
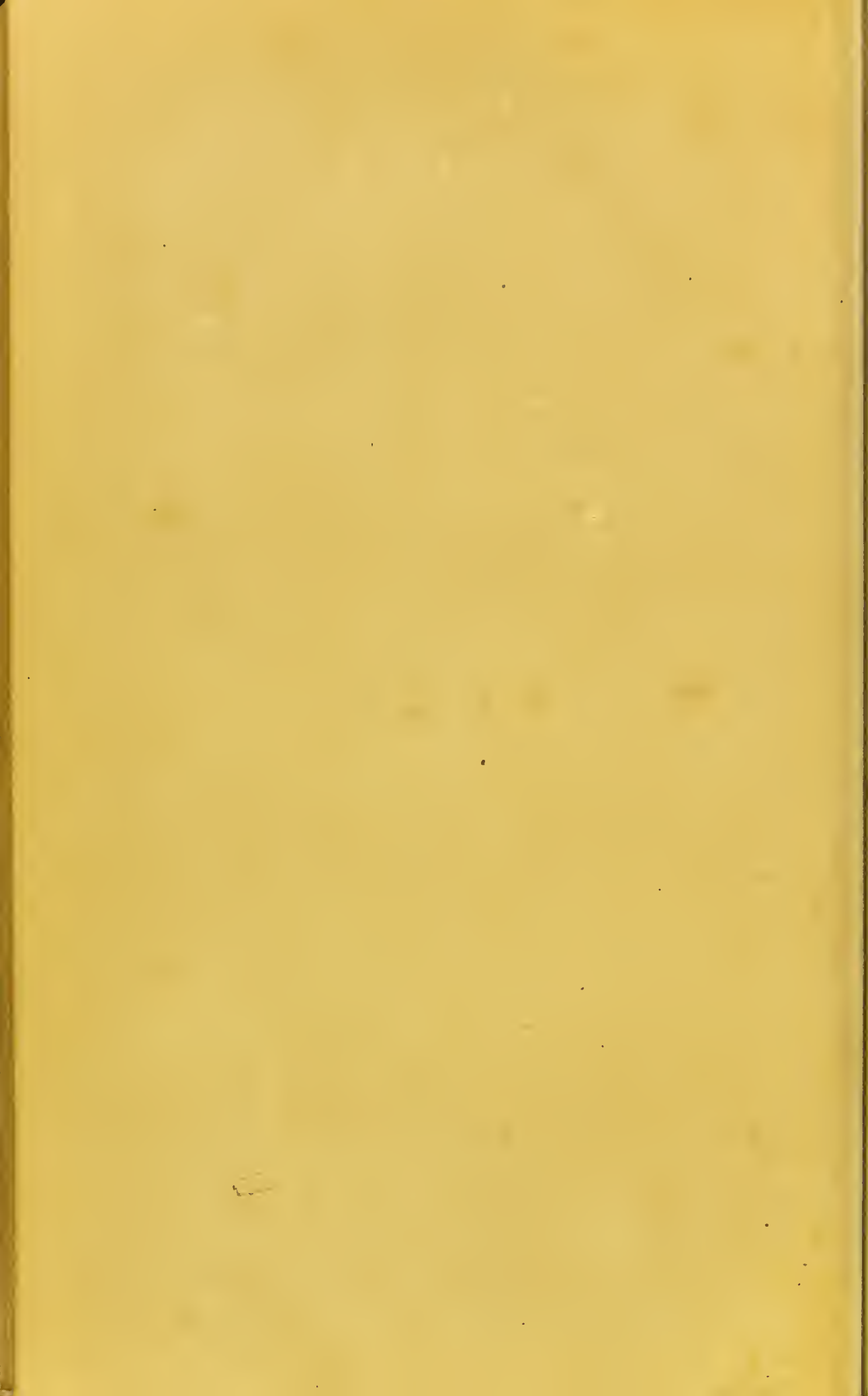
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